



# For Reference

Not to be taken from this room











# **Northeastern University/Combined Catalogs**

Boston-Bouvé College

College of Business Administration

College of Criminal Justice

College of Education

College of Engineering

College of Liberal Arts

College of Nursing

College of Pharmacy and Allied Health Professions

Lincoln College

University College

## ***Graduate Schools***

Arts and Sciences

Business Administration

Education

Engineering







northeastern university



undergraduate catalog  
1971-1972



The New England Association of Colleges and Secondary Schools accredits schools and colleges in the six New England states. Membership in one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators. Colleges support the efforts of public school and community officials to have their secondary schools meet the standards of membership.

# northeastern university undergraduate catalog 1971-1972

boston•bouvé  
business administration  
criminal justice  
education  
engineering  
liberal arts  
nursing  
pharmacy and allied health professions

Northeastern University  
360 Huntington Avenue  
Boston, Massachusetts 02115



NORTHEASTERN

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## ACADEMIC CALENDAR FOR BASIC COLLEGES 1971-1972

September 21 (Tuesday)	Freshman Registration—Beginning of Orientation Period
September 27 (Monday)	Upper-Class Registration—Beginning of Fall Quarter for Division A Students and Freshmen Changeover Date—Beginning of Fall Quarter Co-op Term
October 11 (Monday)	Holiday—No Classes
October 25 (Monday)	Holiday—No Classes
November 25 and 26 (Thursday and Friday)	Holiday—No Classes
December 13-17 (Monday-Friday)	Final Examination Period for Fall Quarter
December 20- January 2, 1972	Christmas Vacation—No Classes
January 3 (Monday)	Registration—Beginning of Winter Quarter for Division B Students and Freshmen—Changeover Date—Beginning of Winter Quarter Co-op Term
February 21 (Monday)	Holiday—No Classes
March 20-24 (Monday-Friday)	Final Examination Period for Winter Quarter
March 27-31 (Monday-Friday)	Vacation for Freshmen and Division B Students
April 3 (Monday)	Registration—Beginning of Spring Quarter for Division A Students and Freshmen—Changeover Date—Beginning of Spring Quarter Co-op Term
April 17 (Monday)	Holiday—No Classes
May 29 (Monday)	Holiday—No Classes
June 12-16 (Monday-Friday)	Final Examination Period for Spring Quarter
June 19-23 (Monday-Friday)	Vacation for Division A Students
June 18 (Sunday)	Commencement
June 26 (Monday)	Registration—Beginning of Summer Quarter for Division B Students and Freshmen in Summer Quarter—Changeover Date—Beginning of Summer Quarter Co-op Term
July 4 (Tuesday)	Holiday—No Classes
September 4 (Monday)	Holiday—No Classes
September 5-8 (Tuesday-Friday)	Final Examination Period for Summer Quarter
September 11-22 (2 Weeks)	Vacation for Division B Students
September 19 (Tuesday)	Freshmen Registration (Class of 1977—Beginning of Orientation Period)
September 25 (Monday)	Upper-Class Registration for Fall Quarter (Division B)



### **Office Hours**

#### **INTERVIEW PERIODS**

Monday through Friday      9:00 A.M. - 4:00 P.M.

Saturdays (by appointment)    9:00 A.M. - 11:30 A.M.

Guided tours of the University are scheduled  
on weekdays by request.

The office is closed on all legal holidays.

Requests for catalogs and information should  
be addressed to

**THE DEAN OF ADMISSIONS**

**NORTHEASTERN UNIVERSITY**

360 Huntington Avenue

Boston, Massachusetts 02115

Office: 150 Richards Hall

Tel. 437-2200



# MAP REFERENCE

F6 F10 E6 G7 A6 H6 F5 E9 G8 F8 G6 G5 B5 F4 F7 G10 B6 E4 E4 J3 H3 F9 F3 E7 H9 G5

# Building Designation

Barletta Natatorium  
Botolph Building  
Cabot Physical Education Ctr.  
Churchill Hall  
Cushing Hall  
Dana Research Center  
Dockser Hall  
Dodge Library  
Ell Student Center and  
Alumni Auditorium  
Forsyth Building  
Forsyth Building Annex  
Forsyth Dental Building  
Greenleaf Building  
Hayden Hall  
Hurtig Hall, (Chemistry)  
Kennedy Building  
Knowles Center (Crim. Justice)  
Knowles Center (Law)  
11 Leon Street  
Afro-American Institute  
Mugar Life Sciences Building  
Parker Building  
Richards Hall  
Robinson Hall  
United Realty Building

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---

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# historical statement

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouv  College (1964), and the College of Criminal Justice (1967). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, the pharmaceutical sciences, professional accounting, business administration, and law.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

# other schools and colleges of the university

## **Lincoln College**

Lincoln College offers part-time evening programs leading to associate and/or bachelor's degrees in Allied-Medical Technology, Civil Engineering Technology, Commercial Aviation Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Additional programs in Industrial Technology, Medical Technology, Chemical-Biological Technology, and Cytotechnology, leading to the Bachelor of Science degree, are offered in collaboration with University College.

## **University College**

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time evening programs in Liberal Arts, Business Administration, Law Enforcement Education, and Health-Related Programs, leading to the Associate in Science and Bachelor of Science degrees.

University College and Lincoln College offer a joint program in Allied-Medical Technology conducted in affiliation with a number of hospital schools of medical technology approved by the American Medical Association. Students receive a Bachelor of Science degree from University College, and they may write the examination for certification as a registered medical technologist (ASCP).

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, at the Suburban Campus in Burlington, and at the Framingham, Weymouth, and Lynn High Schools.

Day programs for adults, under the direction of University College, were developed to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day.

Program advisers are available by appointment day and evening in the University College Office. These faculty members are competent to assist the student in planning a program suitable to his general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by



calling the University College Office (437-2400) or by coming in person to 102 Churchill Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

### **Center for Continuing Education**

The Center for Continuing Education was established in 1960 to relate the University to various unmet educational needs of the community in this period of accelerated change. Its workshops, conferences, institutes, forums and special programs cater to the interdisciplinary educational needs of professional people, who come to the learning experience with a body of knowledge to share. Each department of the Center develops special learning opportunities that focus on the forces which produce changes in society so that individuals may relate constructively to their shifting environments and participate effectively as informed persons in helping to shape the future. Activities of the Center have stimulated widespread interest so that several of its programs are partly supported on grants and serve as models for developing similar continuing educational programs elsewhere.

Programs in continuing education are conducted at several campuses of the University, in the private facilities of business and industrial organizations, at community centers and government agencies, and at Henderson House, the University's residential conference center in Weston, Massachusetts.

Persons prominent in their professions and faculty of several nearby educational institutions serve as part-time instructors and resource persons in the implementation of the Center's programs. Activities of these experts are coordinated by an innovative full-time faculty whose function it is to explore and identify unmet community needs for continuing education, anticipate socio-economic trends in society that contribute to educational needs, enlist the support of experts for structuring appropriate learning experiences, counsel students, and implement as well as evaluate the programs offered. Approximately 6,800 part-time students and about 300 part-time instructors participate in the Center's programs annually.

## **GRADUATE AND PROFESSIONAL SCHOOLS**

The nine graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

### **Actuarial Science**

Master of Science in Actuarial Science.

### **Arts and Sciences**

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administra-

## **18 / OTHER SCHOOLS**

tion degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy degree in biology, chemistry, mathematics, physics, psychology, and sociology.

### **Boston-Bouvé**

Master of Science in Physical Education and Recreation Education.

### **Business Administration**

Master of Business Administration.

### **Education**

Master of Education and the Certificate of Advanced Graduate Study.

### **Engineering**

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; the professional engineer degree in Electrical Engineering; the Doctor of Engineering degree in Chemical Engineering; and the Ph.D. degree in the fields of Electrical, Chemical, and Mechanical Engineering. In addition, the intermediate degree of Engineer is offered.

### **Law**

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes twelve months of experience in law offices. There are no courses for part-time or evening students.

The program is directed toward preparing students for the practice of law in any state of the nation. The curriculum has a highly contemporary orientation. Extensive use is made of the Boston metropolitan area to add realism to the academic program, especially as it concerns the legal problems of an urban society.

### **Pharmacy and Allied Health Professions**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology; and the Ph.D. degree in Medicinal Chemistry.

### **Professional Accounting**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

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**Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates.**

### RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



# buildings and facilities

The main campus of Northeastern University is located on Huntington Avenue in the Back Bay section of Boston, near the Fenway.

Many of Boston's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, The Isabella Stewart Gardner Museum, the Harvard Teaching Hospitals, and many schools and colleges both public and private.

Northeastern University's 47-acre campus is divided by Huntington Avenue, with the educational buildings on the south side and dormitories on the north.

The main educational buildings, all of which have been completed since 1938, are of glazed-brick construction in the contemporary classic style. Most are interconnected by closed passageways so that students and faculty may move from building to building under shelter during the winter months.

In Richards Hall are located some of the main administrative offices of the University, offices and laboratories of the Biology Department, and Mechanical Engineering laboratories.

The Sarkis and Vosgitel Mugar Life Sciences Building contains the College of Pharmacy and Allied Health Professions and the Departments of Psychology, Biology, and Chemical Engineering.

Centrally located where it is readily accessible to all students is the Dodge Library, operated on an open-stack plan and equipped to serve effectively the needs of the varied student bodies which comprise the Northeastern community. The Dodge Library is an official depository for government publications and documents.

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of this building. Also included are special drama facilities, a ballroom, a main lounge, fine arts areas, student offices, conference rooms, meeting areas, and a student dining area seating more than 1,000 persons.

Hayden Hall provides the principal facilities of the Colleges of Liberal Arts and Business Administration. Offices of all the graduate and professional schools except Education are located here, together with those of the University Registrar and other administrators.

Churchill Hall contains the administrative offices of University and Lincoln Colleges and physics laboratories. On the ground floor is the faculty and staff cafeteria.

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

Mary Gass Robinson Hall contains the offices of the College of Nursing and of Physical Therapy; nursing, biology, and physical therapy laboratories; radio and TV facilities; lecture rooms; and classrooms.

The United Building is the location of the offices of the Departments of Mathematics, Economics, Journalism, Sociology, and Industrial Engineering and research facilities for Biology, Psychology, and Mechanical Engineering.

The Charles A. Dana Research Center houses research facilities for Physics and Electrical Engineering.

Three other buildings on the campus have been completely remodeled and reconditioned for educational purposes. These are the Botoiph Building, which houses the Department of Civil Engineering; the Forsyth Building, in which are located the University Health Services, the planetarium and some of the Mechanical Engineering laboratories; and the Greenleaf Building, housing the Earth Sciences and Military Science Departments and research facilities.

The Charles and Estelle Dockser Hall, a five-story structure, houses Boston-Bouvé administrative offices, classrooms, laboratories, and faculty offices, as well as a library, dance studio, gymnasium, and recreation center.

The Barletta Natatorium, an addition to the Cabot Center, contains a 105-foot swimming pool for instruction and intercollegiate competition, a practice tank for the rowing team, a weight room, handball courts, and shower and dressing facilities.

The Edward L. Hurtig Hall, devoted entirely to chemistry, contains classrooms and laboratories for undergraduates as well as special research facilities for

## **22 / BUILDINGS AND FACILITIES**

graduate students and faculty. It also houses the departmental library as well as lecture halls and offices.

The Asa S. Knowles Center, completed in 1969, is the University's newest building. It is the headquarters of the School of Law and the College of Criminal Justice. The Departments of Graphics, Philosophy, and Political Science have their offices here.

Ethel G. and Reuben B. Gryzmish Hall, the section of the Knowles Center in which the School of Law is housed, was opened in 1970. Gryzmish Hall is a building especially designed for the School's distinctive program of legal education. It contains a law library, student lounge, moot courtroom, jury room, judge's chambers, classrooms, and offices.

### **DORMITORIES**

Dormitory facilities accommodate 2395 undergraduate students—969 men and 1426 women. The facilities for men consist of five dormitories: White Hall—the largest men's dormitory—houses 393 residents, Melvin Hall (143), Light Hall (50), 153 Hemenway Street (123), and 115-119 Hemenway Street (260). Women reside in the following dormitories: Speare Hall (404), Stetson West (400), Stetson East (425), and Smith Hall (197).

All of the dormitories contain lounges for relaxation, study rooms, laundry facilities and television rooms. Five large dining rooms are located in the dormitories.

In addition to the foregoing, there is an apartment house complex which is capable of housing 279 students. The facility is used for upper-class students on a first-come, first-served basis.

None of the facilities are more than a five-minute walk to the classroom.

### **PARKING**

Adjacent to the campus are parking areas for 2,400 automobiles.

### **OFF-CAMPUS FACILITIES**

Northeastern University operates one of the nation's finest off-campus centers for continuing education at Henderson House in Weston, Massachusetts, which is 12 miles from the main campus on Huntington Avenue.

The University conducts some of its courses at the Suburban Campus, near Route 128 in Burlington, Massachusetts, and Northeastern's Center for Management Development uses facilities on the campus of Phillips Academy in Andover, Massachusetts.

Athletic facilities for football and baseball are located at Parsons Athletic Field, Kent Street, Brookline.

One of the University's most beautiful off-campus properties is the Warren Center for Physical Education and Recreation Education in Ashland, Massachusetts. Located on the 200-acre site is a large balconied lodge and six woodland cottages. At various times during their academic program, Boston-Bouvé students live at the Center to gain practical experience in camp leadership and outdoor education.

Northeastern has recently established a Marine Science Institute as a research and instructional facility primarily engaged in studies of Marine Biology and Oceanography. The Institute, operated year round, is located on East Point, Nahant, which is situated about 20 miles northeast of Boston on a promontory jutting out into Boston Harbor.









# general information

## **Policy on Changes of Program**

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

## **Textbooks and Supplies**

The Northeastern University Bookstore, located on the ground floor of the Ell Student Center, is a department of the University and is operated for the convenience of the student body. All books and supplies which are required by the students for their work in the University may be purchased at the Bookstore.

## **Part-Time Work**

Students who find it necessary to accept part-time jobs while attending college may obtain such work through the Office of Financial Aid.

Students are not justified in assuming that the University will take care of their expenses or guarantee to supply them with work sufficient to meet all their needs.

A student should have funds adequate to meet the expenses of the freshman year. They should amount to at least the first year's tuition plus books and supplies, and room and board for 36 weeks.

## **The Academic Year**

Northeastern University operates on a quarter system calendar.

**Quarter Hour Credits**

All courses are evaluated in terms of quarter hour credit. A quarter hour credit is equal to three-fourths of a semester hour credit.

**GRADES AND EXAMINATIONS**

**Examinations**

Examinations covering the work of the quarter are usually held at the close of each quarter. Exceptions may be made in certain courses where, in the opinion of the instructor, and with the approval of the Dean of the College concerned, final examinations are not necessary.

**Pass-Fail System**

Students may register for a limited number of courses on a pass-fail basis. Each college has its own rules governing this system. Common to all colleges, however, is the grading system. Pass-fail grades are not included in the calculation of the quality point average. Only pass grades earn credits toward degree requirements.

**Grades**

A student's grade is officially recorded by letter. Following is a listing of grades with their numerical equivalents:

	Numerical Equivalents
A Outstanding Attainment	4.0
B Good Attainment	3.0
C Satisfactory Attainment	2.0
D Poor Attainment	1.0
F Failure	0.0
I Incomplete	
S Satisfactory achievement in a pass-fail course. Counts towards total degree requirements.	
U Unsatisfactory achievement in a pass-fail course.	
X Incomplete in a pass-fail course.	

A general average of D is not acceptable and will not allow a student to continue at Northeastern University.

Freshman students who are taking a full academic program and who have a weighted average for the year below 1.4 will not be permitted to register for advanced work. Upper-class students should consult the Student Handbook to ascertain the level of continuing achievement required of them by the faculty of their college.

An I, or X (Incomplete), grade is used for a temporary grade to show that the student has not completed the course requirements.

### **Dean's List**

A Dean's List, issued at the end of each quarter, contains the names of upper-class students who have a 3.0 weighted average in all subjects with no grade below C during the preceding period. Freshmen who meet the same standards in their work are included on a Freshman Honor List. No student who is on any form of probation or who is carrying a schedule below eleven quarter hours is eligible for either list.

### **Reports on Scholastic Standing**

Reports for all students are issued at the end of each grading period. Questions relative to grades are to be discussed with the student's faculty adviser.

At the end of each academic year, the student will receive in addition to his term report a complete cumulative copy of his permanent record.

Students are constantly encouraged to maintain an acceptable quality of college work. Parents and students are always welcomed by the college officers and faculty advisers for conference upon such matters.

Parents or guardians will be notified whenever students are advised or required to withdraw from the University. If parents so request, report cards will be sent to them instead of the student.

### **Selective Service Deferment**

Students who wish to be deferred by Selective Service must make such request personally to their draft boards by filing SSS Form 104 once each year. The University will furnish local draft boards with verification of the student's attendance only at the written request of the student. All students are furnished the necessary forms to file for deferment with their fall registration material. Students who begin the academic year with their term of cooperative work will receive these forms at the same time by mail. Because of the cooperative plan, the academic year at Northeastern University runs from September to September.

## **GENERAL CONDUCT**

It is assumed that students come to the University for a serious purpose and that they will conform to such regulations as may from time to time be made. The University community expects each student to respect the rights and privileges of others and to adhere to acceptable standards of personal conduct. Students should exercise their freedom with maturity and responsibility. Students are expected to obey the regulations of the University; to follow the instructions of and pay due respect to University officials. Conduct inconsistent with the general order of the University may result in disciplinary action. Damage to any building or to any of the furniture, apparatus, or other property of the University, will be charged to the student or students known to be immediately involved.

It is desired to administer the discipline of the University so as to maintain a high standard of integrity and a scrupulous regard for truth. The attempt of any student to present any work which is not his or her own, or to pass any examination by improper means, is regarded as a most serious offense and renders the offender liable to disciplinary action. The aiding and abetting of a student in any dishonesty is also held to be a grave breach of discipline.

### **Attendance**

Students are expected to attend all scheduled meetings of their classes.

Absence from regularly scheduled classes in any subject may seriously affect the standing of the student. It may cause the removal of the subject or subjects from the student's schedule.

Laboratory work can be made up only when it is possible to do so during hours of regularly scheduled instruction.

Attendance at all convocations of the student body is compulsory. Exceptions to this rule are made only when the student has received permission from the Director of Student Activities previous to the meeting in question.

### **Attendance at Commencement**

All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean of the College in which the candidate qualifies. Each petition will be acted upon by the academic Dean involved, the candidate having the privilege of appeal to the Vice President for Academic Affairs.

## **STUDENT HOUSING**

The University maintains residence halls on the Boston Campus for both men and women. These facilities can accommodate a large portion of the male freshmen and most of the women students who live away from home.

### **Women's Residence Regulations**

Unmarried women students under age 21 who do not live with their parents or a legal guardian are required to live in a University residence hall while attending classes. If a student's cooperative work assignment is not in her home town and if it is not within commuting distance of a University residence hall, special arrangements are made through the Department of Cooperative Education, with the written approval of her parents. Commuting students who wish to live elsewhere than home are also subject to the University's residence requirements. Students in unauthorized housing are subject to disciplinary action. Questions regarding these regulations must be directed to the Dean of Women.

The University dormitories for women are staffed by Residence Directors and upperclassmen who serve as Dormitory Counselors. Complete facilities are available for living, study and dining. Subscription to the meal plan (3 meals a day, 21 meals a week) is required unless a student is in her cooperative work period, at which time it is optional. Additional information regarding the women's residences and applications for rooms may be obtained from the Dean of Admissions or the Office of Student Affairs for Women.

### **Freshman Men's Residences**

The University provides living accommodations in its dormitories for all freshmen under the age of 21 living away from home. The cost is \$435 to \$475 for each quarter, payable at the beginning of the term, and includes three meals each day. Applications for housing may be filed with the Department of Admissions after a student has been accepted. A dormitory deposit of \$100 must accompany the application for housing. The student's receipt of this \$100 deposit from the University is his guarantee of a room in the dormitory. (This deposit is non-refundable and will be applied against the first term's board-and-room charges.) Definite notice of room reservations will be sent by the Director of University Housing in the late summer.

Students should write to the Dean of Admissions for further information and for the Application for Residence.

### **Apartments for Male and Female Upper-class Students**

The University maintains a 100-apartment housing unit which accommodates 280 upper-class students. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are fully furnished with beds, chairs, desks, stoves, refrigerators, and kitchen table. The cost is \$15 per week per student (\$180 per 12-week term) payable at the beginning of the term. The cost includes all utilities.

A \$50 deposit is required when making application for the upper-class apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first-come, first-served basis.

### **Fraternity Housing**

Certain fraternities provide opportunities for room and board for men at reasonable rates. Information regarding these housing facilities may be obtained from the Office of University Housing.

### **Regulations Concerning Off-Campus Housing**

Upper-class male students and women students are free to make their own housing plans without receiving permission or approval from the University. The local address of all students must be on file with the Registrar's office. Home addresses should only be used by those students who are actually commuting

from their home to the University on a daily basis. The proper address must be recorded on the reverse side of the schedule card at the time of registration. It is important for the University to know the current address of all students in case of emergency situations.

Questions regarding the availability of housing should be directed to the Office of University Housing.

### READING IMPROVEMENT

The Center for Reading Improvement offers a special non-credit course for undergraduate students with average and above average reading ability. The purpose of this course is to teach and apply those reading and study techniques which will improve accuracy and recall of all normal college reading assignments. As a result of such gains, speed of reading increases and the student's versatility in handling all levels of reading material increases as well.

Classes meet once a week for two hours and run for one quarter. Students may register *during* the first week of the Fall or Winter or Spring quarter and will be given a choice of several classes scheduled throughout the week.

There is no tuition charge to full-time undergraduate students and all materials are supplied at no expense.

Prompt registration is recommended for the best possible choice of classes.

### LIBRARIES

The library system on the Boston Campus of Northeastern University consists of the main collection in the Dodge Library, with three divisional libraries for Physics/Electrical Engineering, Math/Psychology, and the Science Building Library, in addition to the School of Law Library. The Suburban Campus at Burlington has its own library and there are libraries at the Marine Science Institute in Nahant, Mass., and the Center for Management Development in Andover, Mass.

The collections include physical volumes, microfilm, periodicals, government documents, and recordings. There are duplicating facilities as well.

A handbook and orientation lectures introduce new students to methods of utilizing the resources of the library.

#### Library Staff

Roland H. Moody, A.B., B.L.S.  
*Director, University Libraries*

Albert M. Donley, Jr., A.B., M.S.  
*Associate Director, University Libraries*

Miss Arline Willar, A.B., M.S.  
*Asst. Librarian for Public Service*

Mrs. Anastasia Cakste, B.E., M.L.,  
M.L.S.  
*Phys./EE Div. Librarian*

Mrs. Wendy Katz, B.A.  
*Math/Psychology Div. Librarian*

Mrs. Barbara Reyes, B.A., M.A.L.S.  
*Circulation Librarian*

Miss Joyce E. Lunde, A.A.  
*Asst. Librarian for Ref., Bibl.,  
 & Docs.*

Robert G. Murray, A.B., M.Ed., M.L.S.  
*Asst. Librarian for Cataloging*

Thomas H. Cahalan, B.A., M.S.  
*Asst. Librarian for Acquisitions*

Maurice Rahilly, B.S., M.L.S.  
*Asst. Librarian for Divisional  
 Libraries*

Arthur Youtz, B.S., B.A., M.A.  
*Librarian, Burlington Campus*

Mark Alpert, A.B., M.S.L.S.  
*Reserve Book Librarian*

Miss Roberta Palen, B.A., M.S.L.S.  
*Documents Librarian*

Miss Nieves Farin, B.S., M.S.L.S.  
*Selection Liaison Librarian*

Mrs. Mary Gould, A.B., M.L.S.  
*Interlibrary Loan Librarian*

Mrs. Vivian A. Rosenberg, B.A., M.Ed.  
*Audio Facility Librarian*

## OFFICE OF EDUCATIONAL RESOURCES

The Office of Educational Resources supports faculty and students with (1) multi-media classrooms for both group and independent study, (2) an instructional systems development group, (3) audio-visual production facilities, and (4) an instructional media distribution service.

Through its two divisions, Instructional Systems Development and Instructional Media, the Office is dedicated to providing innovative methods for improving the effectiveness of instruction. Materials are developed in collaboration with faculty for the purpose of supplementing lectures, providing prerequisite, remedial, or review skills and knowledge, presenting complete course units through more efficient means (e.g. programmed instruction or video tapes), or making available learning enrichment opportunities requested by individual students.

The Office of Educational Resources is equipped with a center for programmed study, electronically controlled video and audio study carrel positions (dial access retrieval), an individualized student response multi-media lecture hall, an audio-visual workshop area, an "audio-tutorial" library reserve system, a multi-purpose experimental classroom, an instructional technology information center, an instructional materials center, a TV studio, an audio studio, a film, slide, and graphics production lab, and an equipment loan facility servicing both faculty and student groups. Staff members in each division augment their regular duties by participating in teaching assignments or engaging in research into the many ramifications of educational technology.

### Staff

#### *Office of the Director*

Alvin Kent, B.A., M.Ed.

*Director*

#### *Division of Instructional Systems Development*

Thomas E. Cyrs, Jr., B.A., M.Ed., Ed.D. *Director*

Renate Lepehne, B.A., M.Ed. *Instructional Designer*

A. Elizabeth Norman, B.S., M.A. *Instructional Designer (Health Sciences)*



J. Stephen Bradbury  
 Rita Goncz  
 Leonard A. Morrison, B.A.  
 Alan H. Gleiner, B.A., M.Ed.  
 Eliat B. Goldman, B.A.  
 Elwin D. Mills, B.A.  
 Dexter B. Merry  
 Arthur Murphy  
 James A. Stine

*Instructional Designer*  
*Instructional Designer*  
*TV Production Specialist*  
*TV Production Specialist*  
*TV and Film Production Specialist*  
*Technical Supervisor*  
*Video Technician*  
*Video Technician*  
*AV Technician*

#### *Division of Instructional Media*

Mina B. Ghattas, B.A., M.Ed., Ph.D.  
 Elizabeth J. Tenore, B.A., M.Ed.  
 Linda B. Levine, B.A., M.Ed.  
 Carol A. Poulliotte, B.A.

*Director*  
*Coordinator Learning Facilities*  
*Instructional Materials Specialist*  
*Instructional Technology Information Specialist*  
*Film Library Specialist*  
*Graphic Artist*  
*Photographic Specialist*  
*AV Evening Supervisor*  
*Media Services—Booking and Control*  
*Learning Facilities Asst.*  
*Learning Facilities Asst.*

Edward T. O'Dwyer, Jr.  
 Janet L. Trapp, B.A.  
 Mark H. Ross  
 Joseph V. Scaduto, B.A., M.Ed.  
 William A. Chatfield, B.A.  
 C. Melissa Jelm, A.S.  
 Lawrence Sousa

### **COUNSELING AND TESTING CENTER**

The purpose of the Counseling and Testing Center is to help students with many different kinds of concerns. Some of these have to do primarily with educational and vocational planning; others have more to do with personal problems, feelings, and difficulties in getting along with people, etc. The student is encouraged to discuss his concerns with a counselor, following which he might do one or more of the following: continue individual discussions with the counselor; take psychological tests to increase his knowledge of himself; join a group of students with whom he can share his concerns; make use of the extensive file of information about careers and schools.

The services of the Center are available without charge to all students in the Basic Colleges. An appointment can be arranged by phoning 437-2142 or by stopping by the Center in Room 302 EII.

Vocational counseling services are also available on a fee basis to high school students and to adults.

The counseling services of the Counseling and Testing Center are approved by the American Board on Counseling Services.

#### **Staff**

Philip W. Pendleton, B.A., M.A., Ph.D.  
*Director*  
 Priscilla Belcher, A.B., Ed.M.  
*Assistant Director*  
 David M. Fischl, M.Ed.  
*Counselor*

Alan C. O'Hare, B.A., M.Ed.  
*Counselor*  
 Gordon B. Parkhurst, B.A., M.Ed.  
*Counselor*  
 Richard S. Seaman, B.A., M.A.  
*Counselor*



**CAREER INFORMATION CENTER**

The Career Information Center has the responsibility of preparing career materials for use in high schools and junior high schools. The Center maintains a library of career filmstrips and career tape recordings which are available to Northeastern students who may have a particular interest in the titles prepared by the Center. Arrangements for viewing filmstrips or listening to tapes may easily be made by visiting the Center in 155 Richards.

**Staff**

Donald K. Tucker, M.Ed.  
*Director*

Ruth M. Townsend, A.S.  
*Assistant Director*



# the cooperative plan

## What It Is

The Cooperative Plan of Education is based on the principle that well-educated individuals can best be developed through an educational pattern which, at periodic intervals, exposes them to the world beyond the boundaries of the campus. Through these controlled and structured experiences the students bring an enrichment to the classroom which enhances their total development. It is a means of combining theory with practice. The essential ingredients are that the experiential phase is considered a degree requirement, and the institution assumes the responsibility for integrating it into the educational process.

It is called "Cooperative Education" because it is dependent upon the cooperation of employers and educators in combining to form a superior total educational program for the students. It is not a system of part-time jobs; nor is it an institutionalized means of "working your way through college." The program has an interrelated experience and study content, planned and supervised to produce optimum educational results by providing opportunities that enhance knowledge associated with the students' professional objectives.

Cooperative education is particularly designed to serve the needs of the recent high-school graduate rather than the older, more mature student who already may have had considerable work experience.

In 1960, the Study of Cooperative Education Committee, under the leadership of Dr. Ralph W. Tyler of the Center for Advanced Study in the Behavioral Sciences in California, completed a two-year, nationwide analysis of Cooperative Education programs. The Committee reported that under this unique system of education the students find greater meaning in their studies, their motivation for academic pursuit is increased, they develop greater skills in human relations, their vocational guidance is improved, and through a reliance on their own judgments they achieve a maturity beyond their years.

## How It Works

Most Northeastern cooperative curricula are five years in length, leading to the baccalaureate degree. The program usually consists of a freshman year of three consecutive twelve-week quarters of academic study, followed by four upper-class years on the cooperative plan. Variations of this pattern in some colleges provide for a senior year of full-time academic study.

The curriculum in Physical Therapy is offered on a four-year plan only with cooperative experiences available during the sophomore year. The Associate Degree program in the College of Nursing provides for two upper-class years on the Cooperative Plan.

Upper-class students are divided into two almost equal divisions, designated "A" and "B." Students in one division start the college year with a quarter of classroom work, while their alternates in the opposite division are on cooperative assignment. At the end of the quarter the students in each division change places. This alternation of cooperative experience with classroom work results in each student spending two quarters in school and two quarters on "co-op" each year of the program.

Each student is assigned to a coordinator who is responsible for all phases of the cooperative education program for his group of students. He interviews each student during the freshman year and counsels him regarding the activities of business, industry, government, and the professions as they relate to the student's career objectives. These interviews lead to referral to opportunities which would help the student realize these objectives.

During each of the quarters at college immediately succeeding a quarter on a cooperative assignment, the coordinator confers with the student about the experience and other matters relating to vocational adjustment or personal problems during the quarter. The student's reaction to his situation, coupled with an evaluation of his achievement, is used by the coordinator to guide the student toward his career objectives and to help him obtain maximum value from his education at Northeastern.

### **Placement**

The jobs on which Northeastern students are employed are not protected opportunities or purely observational assignments. They are regular jobs, performed under actual working conditions, offering advancement on the basis of merit. The only privilege accorded Northeastern students is that of attending college on the Cooperative Plan.

The range of opportunities is wide, encompassing all the occupational fields for which the students are preparing at the University. In general the first year of cooperative work can be expected to be of a routine nature, to be followed by increasingly responsible and challenging assignments consistent with the particular student's increase in abilities and aptitudes. Definite training schedules have been established with many of the cooperating employers. The ultimate objective of such schedules is the employment of well-trained graduates by the company, though such employment is based on merit rather than guarantee.

Because of the uncertainties of the employment market as well as other factors beyond its control, the University cannot guarantee to place all students on cooperative assignments. The University also cannot guarantee to place students in any specific geographic location. However, past experience has demonstrated that students who are willing and capable of adapting themselves to existing conditions are almost never without employment except in periods of severe economic recession.

On occasion, a student may engage in an activity other than paid employment during a cooperative period such as travel, independent study, or volunteer services. These experiences can contribute greatly to a student's personal and educational growth.

### Value of Program

Students in cooperative education know that their education is unique. They have the opportunity to test the knowledge and ideas generated on the campus in the arena of realistic application and they know that this experience reinforces their class work, providing a superior educational package.

Cooperative education has a special appeal for students who have arrived at reasonably clear decisions as to the direction of their career development. Available opportunities in government, business, industry, schools, hospitals, or laboratories provide professional training that supplements academic training. The combination assists students to realize their professional objectives.

Students who have not yet settled on a career path also find a cooperative education program invaluable. They are able to observe professions first hand. Preliminary decisions may be confirmed when the student finds the contact with the tentative career field to be satisfying and rewarding. Another student, through this initial contact in a cooperative education program, may find aspects of his intended field to be unacceptable. He is able to establish a new direction to his career with a minimum of disruption.

All students benefit from the exposure they receive from the off-campus world as values learned during co-op periods are integrated with campus experiences.

### The Division of Cooperative Education

Roy L. Wooldridge, Vice President and Dean, B.S., M.Ed.

Thomas E. McMahon, Associate Dean, B.S., M.Ed.

Sidney F. Austin, Associate Dean, B.S., M.Ed.

The Division of Cooperative Education under the direction of the Dean of Cooperative Education, administers service programs through three departments as follows:

#### *The Center for Cooperative Education*

Roy L. Wooldridge, Dean and Director, B.S., M.Ed.

Provides a consulting service for other colleges and universities that are adopting the Cooperative Plan of Education. Develops research projects and publications concerning this method of education.

#### Professors

Charles F. Seaverns, Jr., Director of Training, A.B., Ed.M., C.A.G.S.

James W. Wilson, Research Professor, B.S., M.S., Ph.D.

#### *The Department of Graduate Placement Services*

Alvah K. Borman, Assistant Dean and Director, B.S., M.Ed.

Offers a placement service for all seniors and alumni of University degree-granting programs. Supervises the placement, guidance, and counseling of graduate students on the cooperative program.

**Placement Officers**

Gerard M. Brown, Alumni Placement Officer, B.S.  
 William J. Dutczak, Educational Placement Officer, B.S., M.Ed.  
 Thomas J. McEaney, Senior Placement Officer, B.S., M.Ed.  
 Frank T. Schettino, Graduate Co-op Coordinator, B.S.

*The Department of Cooperative Education*

Paul M. Pratt, Assistant Dean and Director, B.S., M.Ed.

Supervises all undergraduate cooperative students on their regularly scheduled cooperative periods. This includes placement on job assignments as well as guidance and counseling designed to integrate practical experience into the students' total educational program.

**Professor**

Charles F. Field, B.S., M.Ed.

**Associate Professors**

Joseph E. Barbeau, B.S., M.Ed.  
 Ernest V. Barrasso, B.S., M.Ed.  
 Nancy J. Caruso, B.S., M.Ed.  
 Paul E. Dubé, B.S., M.A., M.Ed.  
 Philip W. Dunphy, B.S., M.Ed.  
 Kenneth R. Hancock, Jr., B.S.  
 George K. Howe, B.S., M.Ed.  
 Homer C. Littlefield, B.S.  
 Robert W. Miller, B.S., M.Ed.  
 Roderic W. Sommers, B.S., M.Ed.  
 Harold P. Watts, B.S., M.Ed.

**Assistant Professors**

George H. Baillie, B.S.  
 John Dromgoole, B.S., M.Ed.  
 Mary R. Flynn, B.S.  
 Ralph C. Porter, B.S.  
 Jane S. Schachter, B.S.  
 Robert E. Vozzella, B.A., M.A.

**Instructors**

Borislav P. Berestecky, B.S.  
 Richard L. Canale, B.S.  
 Elizabeth A. Chilvers, B.A.  
 Corinne Cianci, B.A.  
 Donald R. Cordell, B.S.  
 Robert D. Croatti, B.A., M.Ed.  
 Robert D. Deforge, B.S., M.Ed.  
 Ellen M. Durkin, B.S.  
 Anne M. Ealy, B.A.  
 Kenneth J. Grew, B.A., M.Ed.  
 John D. Hammond, B.A.  
 Wayne S. Jack, B.A., M.Ed.  
 Stephen M. Kane, B.S., M.Ed., M.S.  
 Anthony R. Rotondi, B.S.  
 Donald E. Roy, B.S.  
 Ellen N. Winer, B.S., M.Ed.

# alumni association

Over 49,000 alumni of Northeastern are united under an all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 260 of the United Realty Building.

The official publications of the Alumni Association, *The Northeastern University Alumnus*, published semiannually, and *NU Today*, published bimonthly, are sent to all alumni on record.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise awards to outstanding seniors in each of the Colleges, are directed by the Association's Vice President of Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The Alumni Clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held September thru June in the downtown section of the city. A suburban luncheon club meets quarterly in the area of Route 128.

The Association also sponsors and assists the various constituent organizations such as Alumnae Association, Varsity Club, Law, Pharmacy, Boston-Bouv  , and other special groups, all of which have their own officers and conduct vari-

ous programs throughout the year. In cooperation with the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Alumni Association provides a unique and valuable service both to the University and to the community by sponsoring admissions conferences for high school students and for the parents of those students who are interested in attending college. Local residents as well as alumni of the University are invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning the application procedures to our colleges and universities.



# admissions information

## General Requirements for Entrance

The Northeastern University Committee on Admissions believes that candidates should complete a secondary school program which is as challenging as the student's ability enables him to complete successfully. A recommended program should include courses in English, foreign language, mathematics, laboratory science, and history. Of particular importance are the total quality of the school record, continuity and proficiency in subjects which are critical to one's area of study at the University, and a wise choice of elective courses. The high school transcript should provide clear evidence of sound study habits so necessary to success in college study.

All candidates are encouraged to broaden their reading outside of class. It has been said that books stretch the mind. The student who can communicate ideas, understand word meanings, and write effectively is at a distinct advantage in the competition for admission. The Committee on Admissions is especially interested in those applicants who have demonstrated leadership abilities in their home communities or in their schools' student activity programs. Those who have contributed to worthwhile group projects bring highly desirable talents to the University.

Detailed information about admissions requirements may be found in the publication, *Introducing Northeastern University*. This freshman catalog will be of special interest to high school seniors who seek entrance to the University, and it may be obtained upon request from the Department of Admissions.

## Applying for Admission

A combined Application for Admission and School Transcript form may be obtained either by writing to the Department of Admissions, or by requesting one when visiting the University. Special directions for the use of this form accompany the Application for Admission. The application should be properly filled out in ink, signed, and forwarded with a nonreturnable fee of \$15 to the Dean of Admissions, Northeastern University, Boston, Massachusetts 02115. Checks should be made payable to Northeastern University. Candidates are urged to apply for admission during the summer prior to the senior year in high school, or early in the senior year.



## **Rolling Admission Plan**

Under Northeastern's Rolling Admission Plan, candidates may be notified of their acceptance at that point in their secondary school careers when there is sufficient evidence that they will be able to profit from study at the university level. This may occur early in the senior year, or after the results of College Board Examinations have been evaluated. In all cases of early acceptance, candidates are required to complete successfully the senior year of high school.

## **Entrance Examinations**

The results of entrance examinations are regarded by the Committee on Admissions as a useful guidance-placement tool. It is the quality and scope of a student's school record which is of primary importance, yet the results of aptitude and achievement tests are helpful to the admissions counselor in determining that field of study in which a candidate is most likely to succeed. Secondary schools normally forward to the Department of Admissions the results of many test batteries which were administered during grades 9 through 12. It is the consistency of these score ranges which is significant. All candidates are required to complete the Scholastic Aptitude Test and three Achievement Tests of the College Entrance Examination Board. There is no single schedule of testing which is best for all students. As a basic rule, no achievement test should be attempted unless the particular subject is currently being studied. Students are advised to consult their guidance counselors for appropriate testing schedules.

The required achievement tests will vary according to the particular program to which the student has applied. A detailed listing of required tests may be found in the freshman catalog, *Introducing Northeastern University*. Students who are in doubt should consult an admissions counselor.

## **Advanced Placement**

The University grants Advanced Placement credit to those students with a score of 3 or better in their Advanced Placement Examinations. Such students are excused from the basic courses in English, history, chemistry, mathematics, biology, and physics and in the advanced courses in languages to which the examinations apply. They receive full credit for those courses from which they are excused.

Applicants are required to write their Advanced Placement Tests of the College Board in May.

## **College Level Examination Program**

The University may grant credit for successful completion of appropriate examinations in the College Level Examination Program. (CLEP) When this occurs, the amount of credit granted by the dean of the college will be determined in a manner similar to the granting of credit to transfer students who have successfully completed course work in other institutions.

### Health Requirements

The general health of all applicants for admission must be satisfactory. Prior to registration at Northeastern, each applicant must submit on a Student Health Service form supplied by the University evidence of a complete physical examination and chest X-ray. This information must be forwarded to the University physician for his review. Proper health clearance is considered a condition of admission.

Because of the special nature of certain professions which stress bodily coordination, physical skills, rehabilitation and patient care, emphasis is necessarily placed upon sound health. For this reason, those who seek admission to the Boston-Bouv  College or to the College of Nursing are required to receive special health clearance prior to enrollment.

### The Interview

Students who are interested in attending Northeastern are cordially invited to visit the University. Arrangements have been made for a series of Admissions Conferences on Monday through Friday, except for legal holidays, at 10 a.m. and at 2 p.m. Included is a sound filmstrip describing Northeastern and the Cooperative Plan of Education. Candidates who have particular problems of a personal nature may talk with a counselor either before or after the group interview.

Guided tours follow the Admissions Conferences on weekdays at 11 a.m. and 3 p.m. Both should be scheduled at least two weeks in advance.

Because Northeastern does not hold classes for students in the Basic Colleges on Saturdays, applicants are urged to visit the University on a weekday.

Ordinarily, conferences with admissions personnel will be more helpful if candidates have studied the publications, *Introducing Northeastern University* and *Co-opportunities*. These are mailed to those who express interest in Northeastern.

### Required Deposits

If the Committee on Admissions makes a favorable decision on your application, you will be asked to submit a nonreturnable tuition deposit of \$100 by April 1. This deposit serves as an indication of your intention to enroll and is applied to your first-quarter tuition account. A dormitory deposit of \$100 is due at the same time for resident students.

### Registration

Freshmen in the day programs will register at the Boston Campus on Tuesday, September 21, 1971; at the Burlington Campus on Wednesday, September 22. Students are not considered to have met the requirements for admission until they have successfully passed the required physical examination. Registration must be in person.

## Programs for Minority Group Students

Northeastern University deliberately seeks to expand educational opportunities for deserving minority group students and to recruit promising students from economically and culturally disadvantaged backgrounds. In so doing, it has increased its guidance and other supporting services in order that such students may be assured the opportunity to succeed in their chosen fields of study. These supporting services include tutorial study, programmed instruction, and summer study prior to enrollment. Other counseling services are provided by the University's Afro-American Institute. Financial aid is granted as may be required to make college attendance possible.

## ADMISSION OF TRANSFER STUDENTS

A student wishing to transfer into the Basic Colleges of Northeastern University may request advanced standing as an upperclassman on the basis of acceptable credits earned in an accredited two- or four-year institution or a technical institute.

### Basic Requirements

Full details of the University's transfer policy are available from the Department of Admission upon request. Following are the basic requirements:

1. Only a candidate who presents satisfactory college records may be considered for advanced standing credit (cumulative average of C+). No credit is given for the lowest passing mark.
2. Credit is given for those courses which are the equivalent of required subjects offered in the particular college at Northeastern. Credit may also be given for elective courses.
3. Candidates must be in good standing and eligible to continue in the institution they are currently attending.
4. Evidence of honorable dismissal and satisfactory health are required. (Appropriate forms will be sent.)
5. Special student status is not possible in any of the Basic Colleges of Northeastern.

### Application Procedure

An applicant for advanced standing is required to:

1. Complete an application for admission no later than May 1 of the year of intended entrance. Transfer students are admitted only in September.
2. Submit a transcript of his high school record.
3. Request that an official college transcript of his completed courses be sent, as well as a list of courses which will be completed prior to the end of the academic year.

NOTE: Transfer students are not required to take College Board Tests.

Candidates must apply no later than May 1. All records must be received by the Department of Admissions no later than June 15 of the year of intended entrance. Upon receipt of all items required, the candidate will be notified of the action taken.

### **Financial Aid**

A number of scholarships, loans, and grants are available to qualified transfer students.

The University does not award financial assistance in any form to foreign students.

Candidates must submit an application to the Office of Financial Aid and file a Parents' Confidential Statement with the College Scholarship Service, Box 176, Princeton, New Jersey, no later than May 1.

Further information may be obtained from the Office of Financial Aid.

### **Outline of Freshman Courses**

The first year is a period of full-time study during which the student must demonstrate fitness for the program which has been elected. The cooperative plan of training on the job normally begins with the second year. Students who are unsuccessful in the basic courses of the freshman year will not be permitted to continue with their advanced program, but will be advised to change their goal and type of training. In some instances this will mean change to another curriculum at Northeastern; in others, withdrawal from the institution. The freshmen courses are so arranged as to permit change of objective during or at the end of the first year with a minimum loss of time.

Requests for catalogs, information, or for personal interviews should be addressed to:

**The Dean of Admissions  
Northeastern University  
360 Huntington Avenue  
Boston, Massachusetts 02115**

Office: 150 Richards Hall      Tel: 437-2200

(The University is closed on all legal holidays.)

# college expenses

## TUITION—ALL COLLEGES

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Freshmen — The charge for tuition for all freshmen attending the Huntington Avenue and Burlington Campuses is \$565 per quarter.

Engineering Upper-Class Students — The charge for tuition is \$800 per quarter. Liberal Arts, Education, Business Administration, Pharmacy, Boston-Bouvé, Criminal Justice, and Nursing Upper-Class Students — The charge for tuition is \$775 per quarter.

Student Teaching — The charge for student teaching in the College of Education is \$387.50.

Women students in Physical Education have one required (and one optional) three-week camp leadership and outdoor education resident session at the Warren Center. Charge per session, including prorated tuition, living accommodations and food, approximates \$255. Recreation Education students have one such three-week term course with cost at approximately \$255.

Men in Physical Education have a three-week resident camp requirement during the Summer Quarter of the middler or junior year. Students may expect to be assessed for living accommodations and food for the period of time in residence.

A one-week session in skiing is required for Recreation Education and women Physical Education majors. Full cost for Ski Week at North Conway, New Hampshire, including lessons and resident costs, approximates \$90-\$100.

## COSTS FOR FRESHMEN

### Schedule of Tuition and Payments, 1971–72

<u>Date of Payment</u>	<u>Tuition</u>
<i>September 21, 1971</i>	\$565.00
<i>January 3, 1972</i>	\$565.00
<i>April 3, 1972</i>	\$565.00

**Schedule of Dormitory Payments, 1971-72**

	Speare and Stetson	Melvin, White, Smith, Light, Halls	Other Dormitories
<i>Due September 21, 1971</i>			
Dormitory Charge . . . . .	\$475.00	\$460.00	\$435.00
Infirmary fee . . . . .	15.00	15.00	15.00
Total . . . . .	<u>\$490.00</u>	<u>\$475.00</u>	<u>\$450.00</u>

*Due on January 3, 1972*

Dormitory Charge . . . . .	\$475.00	\$460.00	\$435.00
Infirmary fee . . . . .	15.00	15.00	15.00
Total . . . . .	<u>\$490.00</u>	<u>\$475.00</u>	<u>\$450.00</u>

*Due on April 3, 1972*

Dormitory Charge . . . . .	\$475.00	\$460.00	\$435.00
Infirmary fee . . . . .	15.00	15.00	15.00
Total . . . . .	<u>\$490.00</u>	<u>\$475.00</u>	<u>\$450.00</u>

Students should allow an additional amount for clothing, incidentals, and personal expenses. This amount will vary with individual tastes and spending habits.

**Summary of Freshman Expenses Due**

	Dormitory* Student	Non-Dormitory Student
APPLICATION FEE . . . . .	\$ 15.00	\$ 15.00
<i>Due September 21, 1971</i>		
Tuition, 1st Quarter . . . . .	565.00	565.00
Laboratory Deposit (if taking) . . . . .	20.00	20.00
Health Service Fee . . . . .	75.00	75.00
Student Center Charge (Boston) . . . . .	12.50	12.50
Books & Supplies (estimate) . . . . .	100.00	100.00
ROTC deposit (if taking) . . . . .	10.00	10.00
Dormitory charge . . . . .	475.00	
Infirmary fee (1st Qtr.) . . . . .	15.00	
Total . . . . .	<u>\$1287.50</u>	<u>\$ 797.50</u>

(Engineering students should add approximately \$50 for drawing instruments and equipment.)

*Due on January 3, 1972, and on April 3, 1972*

Tuition .....	\$ 565.00 .....	\$ 565.00
Student Center fee .....	12.50 .....	12.50
Dormitory charges .....	475.00	
Infirmary fee .....	15.00	
Total each quarter .....	<u>\$1067.50 .....</u>	<u>\$ 577.50</u>

\*This scale is for Speare and Stetson, other dormitories are slightly less.

### COSTS FOR UPPERCLASSMEN

#### Schedule of Tuition Payments

Date of Payment	Tuition for all Colleges except Engineering	Tuition for Engineering
<i>Division A</i>		
September 27, 1971 .....	\$ 775 .....	\$ 800
April 3, 1972 .....	775 .....	800
<i>Division B</i>		
January 3, 1972 .....	775 .....	800
June 26, 1972 .....	775 .....	800
<i>*Division C (formerly called FT)</i>		
September 27, 1971 .....	775 .....	800
January 3, 1972 .....	775 .....	800
April 3, 1972 .....	775 .....	800

\*Division C is the term used to denote the classification of students who are temporarily or permanently on a non-cooperative academic year. Certain students in the College of Liberal Arts may elect a non-cooperative four year program. In other colleges this program is a temporary one usually required of transfer students in order to phase into the cooperative plan.

### REQUIRED FEES FOR ALL STUDENTS

#### Application Fee

A fee of \$15 is required when the application for admission is filed. This fee is non-returnable.

#### Accident and Sickness Insurance

The University provides an excellent hospital insurance and student health program. All students will pay a non-refundable University Health Service fee

of \$75 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services which are provided to students by the University Health Service.

### **Student Center Fee**

All students in the Basic Colleges on the Huntington Avenue campus are charged a fee of \$12.50 per quarter for the services available in the Student Center building.

### **Graduation Fee**

A fee of \$25 covering graduation is required by the University of all candidates for a degree. This fee must be paid before the end of the fifth week of the last scholastic quarter in the senior year. Candidates in the College of Nursing are required also to pay a charge of about \$10 for their graduation pin.

### **College of Nursing Uniforms**

Students in the Associate Degree Program purchase uniforms in the fall quarter of the freshman year.

Students in the Baccalaureate Degree Program purchase uniforms in the fall quarter of the sophomore year.

The cost is approximately \$40.

## **BOSTON-BOUVÉ COLLEGE UNIFORMS**

### **Uniforms for Physical Therapy Students**

Students in the Physical Therapy Program are required to purchase regulation uniforms and accessories prior to Supervised Clinical Education. The cost of clinic uniforms is approximately \$65.

Women may wear the required gymnasium uniform for laboratory classes. Men are required to wear navy blue shorts and white T-shirts for these classes.

### **Uniforms for Physical Education Students**

Men and women majoring in Physical Education are required to purchase uniforms. The cost approximates \$85.00.

### **Uniforms for Recreation Education Students**

Both men and women majoring in Recreation Education have required uniforms; the cost is approximately \$50.

## **DEPOSITS REQUIRED**

### **Tuition Deposit**

Applicants accepted for admission must upon request pay a non-returnable tuition deposit of one hundred dollars (\$100) as evidence of their intention to enroll, and this will be applied on their first tuition payment.



**Dormitory Deposit**

Students who have been accepted for admission to a University dormitory must upon request pay a non-returnable dormitory deposit of one hundred dollars (\$100). This deposit will be applied to the first quarter payment.

**Laboratory Deposits**

Students taking laboratory courses, i.e. Chemistry, Biology, Pharmacy, etc., should be prepared to purchase laboratory deposit cards from the Bursar as directed by the department offering the course. These deposits will be charged with deductions for breakage, chemicals, and destruction of apparatus in the laboratory. Deposit cards are available for \$20 each, and unused portions are refundable. A charge of \$5 each is made for extra cards.

**Reserve Officers' Training Corps—Uniform Deposit**

Freshmen enrolling in ROTC make a deposit of \$10 to cover loss of or damage to ROTC uniform and equipment. Any loss or damage exceeding the deposit will be charged to the student.

**OTHER FEES****Payment of Tuition**

All payments should be made at the Bursar's Office. Checks should be made payable to Northeastern University. Students are not eligible to attend classes beginning with the second week of any quarter unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment. Deferred payment of tuition entails a fee of two dollars (\$2).

**Late-Payment Fee**

A fee of ten dollars (\$10) will be assessed for failure to make or arrange for payments in accordance with the prescribed regulations.

**Late Registration Fee**

A fee of \$5 will be charged for failure to register in accordance with prescribed regulations on the dates specified in the college registration bulletins. Registration must be made in person.

**REFUNDS**

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Dean of Students' Office.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

**Amount of Refund**

<b>Official Withdrawal Filed Within</b>	<b>Percentage of Tuition</b>
1st week of Quarter	100%
2nd week of Quarter	75%
3rd week of Quarter	50%
4th week of Quarter	25%

# financial aid

Financial Aid is granted on the basis of financial need. Within the limits imposed by the availability of funds, Northeastern will make every effort to assist any student in good standing whose personal and family resources are insufficient to meet the cost of attendance.

Students granted financial aid receive, in most cases, a Financial Aid Package which consists of scholarships, loans, and part-time employment.

Scholarships are made available by the state and Federal governments and through the generosity of individuals and business organizations concerned with student welfare. With the exception of those scholarships sponsored by the state or Federal government, these awards carry a moral obligation for repayment at some future date.

Loan assistance is largely federally guaranteed and requires repayment after graduation at modest interest rates and over a long period of time.

The University does not award financial assistance in any form to foreign students.

Part-time employment is provided either by Northeastern directly or jointly by Northeastern and off-campus agencies under the auspices of the College Work-Study Program.

Detailed information as to the procedure to follow in applying for aid can be found in the Freshman Catalog and in the Handbook for Students.

## SCHOLARSHIPS FOR FRESHMEN

Students interested in applying for freshman scholarships, loans, and employment may obtain detailed information from the Freshman Catalog.

### Alumni Scholarships

All Colleges

Scholarship aid is available to entering freshmen who are relatives of alumni. Applicants must show evidence of scholastic achievement and financial need.

### Henry B. Alvord Memorial Scholarships in Civil Engineering

Engineering

Established in 1940 in memory of the late Henry B. Alvord, Professor of Civil Engineering and Chairman of the Department for eighteen years, the award is made annually to a student graduating from an accredited secondary

school who demonstrates superior academic ability and gives promise of succeeding in civil engineering. The grant of \$250 is made only to an entering freshman who is qualified for and plans to study civil engineering.

### **Armstrong Rubber Company Scholarships**

All Colleges

Established in 1960, the Armstrong Rubber Company of West Haven, Connecticut, offers annually a scholarship in the amount of \$1,800 to a qualified boy or girl admitted to the University for a full-time program of study. Although children of Armstrong Company employees are given preference, any student residing in New Haven County is eligible to apply.

Recipients of the scholarship will participate in the University's cooperative program and will be expected to spend at least four periods of student employment with the firm. Scholarship applications are available from the Company upon request and should be returned to the Personnel Office no later than April 30 of the year in which the student plans to enter the University.

### **Badger Company, Inc., Grant Program**

Engineering

The Badger Company, Inc., has made available to Northeastern University two grants of \$1,200 each to be given to first-year students. Recipients must be from the secondary schools in the Greater Boston area who have been accepted into the College of Engineering. Summer employment shall be available to the recipient(s) of the grant during the summer before his matriculation at the University; and cooperative work will be offered as long as positions are available, during his undergraduate years.

### **George L. Barnes Scholarship**

All Colleges

This fund was established in 1969 by Miriam P. Poole, daughter of George L. Barnes, in memory of her father, a distinguished member of the Northeastern University Corporation and Board of Trustees from 1937 until his death in 1965.

The income from this fund will provide a full scholarship annually to some deserving boy from Weymouth. The award is made on the basis of need and character. Some additional assistance may be given in the upper-class years.

### **The Godfrey L. Cabot Scholarship Fund**

All Colleges

This fund was established by Dr. Cabot in 1954 in order to help meet the college expenses of employees or children of employees of Godfrey L. Cabot, Inc., and its subsidiary and associated companies. To be eligible, the employee must have completed at least five years of service to the company prior to the time the student enters the University. The University shall determine the number and amount of these scholarships, which are not limited to outstanding students and which are available to evening as well as day students. Students interested in applying for scholarship aid from this fund should communicate with the Cabot personnel office or the Office of Financial Aid at Northeastern University.

### **The Gardner A. Caverly Scholarship**

All Colleges

This scholarship was established in 1957 through the generosity of Mr.

Gardner A. Caverly, an alumnus of the College of Business Administration and a member of the Class of 1934. Its purpose is to provide financial assistance and encourage qualified students from the New England area to attend Northeastern University. In selecting worthy students for these scholarship awards, preference is given to graduates of the Rutland, Vermont, and Laconia, New Hampshire high schools.

### **Community Scholarships**

All Colleges

The Community Scholarships were established by President Asa S. Knowles in 1963. Northeastern will grant scholarships in the amount of \$500 to qualified students from the following communities: Ashland, three scholarships; Boston, twelve scholarships; Burlington, three scholarships; and Weston, three scholarships.

### **The Cotrell Company Engineering Scholarship**

Engineering

In 1961, The Cotrell Company of Westerly, Rhode Island, established an annual scholarship of \$1,000 to be awarded to a senior in the upper fourth of his class attending a high school in the Westerly area or to a senior in any high school who is the son of an employee of The Cotrell Company. Selection preference will be given to sons of employees and to students who have a long-range interest in the specialized fields of mechanical, electrical, and industrial engineering.

### **The William O. DiPietro Scholarship**

Engineering

This scholarship was established in 1967 through the generosity of Mr. William O. DiPietro, a distinguished alumnus of the College of Engineering and a member of the Class of 1942. The scholarship is awarded annually to one or more deserving freshmen who demonstrate a high caliber of achievement and a desire to fulfill the limits of their ability in both academic and cooperative periods of study. In considering recipients for this scholarship, preference will be given to sons of employees and to students who have a desire to major in Chemical Engineering. It is intended that those students receiving awards from this scholarship might someday contribute to this or other scholarships themselves, thereby perpetuating growing funds that will help other deserving individuals.

### **Educational Opportunity Grants**

(See section describing Federal Programs.)

### **Carl Stephens Ell Alumni Scholarships**

All Colleges

To honor Dr. Carl Stephens Ell, the second president of Northeastern University, the Alumni Association, in 1958, established these scholarships. Either freshmen or upperclassmen enrolled at the University are eligible. Awards will be made to worthy students on the basis of scholastic ability and need. The scholarships are to be distributed as equitably as possible among students in the Basic Colleges and University College. Preference shall be given to sons and daughters of Northeastern Alumni.

**Elmer H. and Daisy M. Everett Scholarship**

All Colleges

The purpose of this fund, established in 1961 by Mr. and Mrs. Elmer H. Everett, is to provide scholarship aid for a qualified entering freshman or upper-class student who will receive the greatest benefit from this assistance. The scholarship, to be awarded annually, will be equal to one-half tuition for a full academic year.

Preference will be given to a worthy student who is a member of, or the son or daughter of a member of, the Carter Memorial Methodist Church of Needham Heights, Massachusetts, or to another student suggested by the minister of this church. Should there be no qualified candidate available from the above source, then the scholarship shall be awarded to any worthy boy or girl.

**The George Raymond Fennell Memorial Scholarships** Business Administration

Two full-tuition scholarships are awarded each year to first-year students enrolled in the College of Business Administration. The scholarships are awarded in memory of George Raymond Fennell, formerly Assistant Director of Admissions and Director of the Northeastern Student Union.

**General Motors Scholarship**

All Colleges

General Motors has a vital interest in higher education in America. Under its "College Plan," one five-year scholarship is granted to a high school senior of high ability who has been admitted to one of Northeastern's Basic Colleges. The selection is made from among all students accepted for admission. A special application is not required. (*Alternate years commencing with 1971.*)

**College of Nursing Scholarships**

Nursing

Scholarships are made available to students in the College of Nursing through a fund established by contributions from Northeastern University, Permanent Charities Fund, Massachusetts General Hospital, Children's Hospital Medical Center, Beth Israel Hospital, New England Deaconess Hospital, and Peter Bent Brigham Hospital. The application procedures and qualifications for selection are the same as those for all other scholarships.

**Charles Hayden Memorial Scholarships**

All Colleges

The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of the Boston English High School, offers annually memorial scholarships to freshmen at Northeastern University. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.

**The Edward L. Hurtig Scholarship**

All Colleges

This scholarship was established in 1968 through the generosity of the Hurtig family in memory of Edward L. Hurtig, an alumnus of the College of Engineering, Class of 1946. The scholarship is awarded annually to an entering freshman in the day colleges who has demonstrated the necessity for financial aid. Preferences will be given to recipients of the Educational Opportunity Grants Scholarship Program of the United States Office of Education.

**The Maurice A. and Nellie L. Idelson Award**

All Colleges

This award, established in 1968, is given annually to an entering freshman in the day colleges who has demonstrated the need for financial aid. Preference will be given to graduates of the Boston English High School. Should there be no qualified candidate from this source, the award will then be given to any worthy student.

**Regional Scholarships**

All Colleges

Secondary school students who reside in rural areas of New England, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their principals and guidance counselors, may qualify for a Regional Scholarship. Scholarships range from \$200-\$1400.

**Reserve Officers' Training Corps Scholarship Program**

(See section describing Federal Programs.)

**Spofford Scholarship Fund**

All Colleges

The Spofford Scholarship is awarded annually to an American Negro, American Indian, or multi-racial freshman who demonstrates severe financial need.

**Clinton H. Scovell Scholarships**

Boston-Bouvé

Scholarships are made available annually to men and women students in Boston-Bouvé College through a fund provided by the will of Clinton H. Scovell.

**The Sidney L. Sholley Memorial Scholarships**

All Colleges

The Sidney L. Sholley Memorial Scholarships have been established by the Trustees of the Keystone Charitable Foundation in memory of Mr. Sidney L. Sholley, founder and first president of the Keystone group of mutual funds. Two scholarships of \$600 each will be awarded annually to incoming freshmen. Recipients of the scholarships will be known as the Sidney L. Sholley Scholars.

**Trustee Scholarships**

All Colleges

Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the eight basic colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

**Power Systems Engineering Grants-in-Aid**

Electrical Engineering

A number of public utilities and power equipment manufacturing companies in the northeastern part of the United States have made available grants-in-aid ranging from \$1,000 to \$1,800 to assist able freshmen who are planning to undertake the six-year integrated cooperative program in power systems engineering leading to the degrees of Bachelor of Science and Master of Science in Electrical Engineering. These awards are made on the basis of academic achievement in high school and aptitude for and interest in the field of power systems engineering, without regard to financial need.



Candidates for such grants-in-aid should apply to the Dean of Admissions at Northeastern University not later than March 1 of the year in which they wish to enter the College of Engineering.

### SCHOLARSHIPS FOR UPPERCLASSMEN

#### Dr. Martin E. Adamo Scholarship

Pharmacy

This scholarship of \$100 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

#### The Vivian B. Allen Scholarships

Nursing

The Vivian B. Allen Foundation Endowment for nursing scholarships was established in 1968 through the generosity of the Vivian B. Allen Foundation, Inc. The income from a \$500,000 endowment fund is to be used to provide scholarship assistance for students entering or enrolled in the College of Nursing of Northeastern University. The application procedures and qualifications for selection are the same as those for all other scholarships.

#### American Foundation for Pharmaceutical Education Scholarships

Pharmacy

The Board of Grants of the American Foundation for Pharmaceutical Education provides three scholarships of \$200 each to be awarded to junior or senior students on the basis of scholarship and financial need with the understanding that the University will match the awards to the students selected. The use of the funds is restricted to the payment of tuition and laboratory fees.

#### The Boston Section of the American Society for Quality Control Scholarship

All Colleges

This annual award was established in 1961 by the Boston Section of the American Society for Quality Control to provide assistance to a student enrolled in a collegiate program which will prepare him for a constructive career in the broad field of quality control. The recipient must have completed his second year; and in his education or work experience, he must have demonstrated an interest in the broad field of quality control.

The Boston Section has an extensive educational program for those whose work requires an increasing knowledge of quality control, and it is active in enhancing the standards in this field.

#### The Henry Francis Barrows Scholarships

All Colleges

Established in 1949, the four Henry Francis Barrows Scholarships provided under the will of Fanny B. Reed, are offered to Protestant young men, born and brought up in New England. Good scholastic standing, good character, and need must be demonstrated by recipients of the scholarships.

#### The Mr. and Mrs. Emil Matthew Bauer Fund

All Colleges

The interest from the Fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.



**Board of Higher Education Scholarships**

All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited colleges. Awards are made in the fall of each year, and applications for upper-class students are available during April in the Office of the Director of Financial Aid for Students.

**The Boston Paper Trades Association, Inc.,  
Scholarship**

Business Administration

Established in 1966 by the Boston Paper Trades Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his cooperative work achievement and his extracurricular activities an interest and potential in the field of sales. The recipient must be of high character, have a good academic record, and be able to demonstrate financial need.

**The Boston Rubber Group Scholarship**

Chemistry, Chemical Engineering

This scholarship, established in 1962, is to be awarded in whole or in part to one or more chemistry or chemical engineering cooperative students on the basis of merit, need, scholarship, and personal qualifications. The Boston Rubber Group is sponsored by the Division of Rubber Chemistry, American Chemical Society.

**Boston Society of Civil Engineers Scholarship in Memory of  
Desmond FitzGerald**

Civil Engineering

In 1931 the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and an eminent hydraulic engineer with a distinguished record of service.

It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the President of the Boston Society of Civil Engineers at the Society's annual meeting in the spring of the year.

**Brookline Hospital Women's Auxiliary Scholarships**

Nursing

These scholarships, two \$1,000 awards, are available to upper-class nursing students, with preference being given to residents of Brookline. Selection is on the basis of good academic standing and demonstrable financial need.

**Martin Brown Scholarship Fund**

Electrical Engineering

This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. The purpose of this scholarship is to assist qualified students enrolled in electrical engineering who have need and who have demonstrated above-average scholastic ability.

**Wellington Burnham Fund**

All Colleges

This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.

**Louis S. Cashman Memorial Scholarship Fund**

Business Administration

Established by the Massachusetts CUNA Credit Union Association and friends of Mr. Cashman in recognition of his outstanding service to the credit union movement in the Commonwealth.

This scholarship is awarded annually to students in the College of Business Administration who have need with particular preference given to those enrolled in Banking and Finance.

**The William M. Cavanaugh Memorial Scholarship**

All Colleges

This award, established by the members of the Publicity Club of Boston, is open to men and women of the Junior and Senior classes who demonstrate talent in the field of communications. The scholarship of \$100 bears the name of the second president of the Publicity Club (1950-1951) who fulfilled the role of an able and successful newspaper man.

**Chemical Club of New England**

Chemistry, Chemical Engineering

To promote interest in the chemistry or chemical engineering field in New England, the Chemical Club of New England has made generous scholarships available to junior and senior students who are majoring in chemistry or chemical engineering and who show promise of success in either field.

Recipients of these scholarships must be residents of New England and must have financial need, above-average grades, and a good cooperative work record.

**Civil Engineering Department Award**

Civil Engineering

The Civil Engineering Department Award was established by members of that department in order to recognize achievement and to give financial assistance to a student who has elected a major in the field of civil engineering. This award, in the amount of \$100, is financed by gifts from members of the Civil Engineering Department and is awarded to the recipient at the beginning of his sophomore year.

**Connecticut Alumni Club Scholarships**

Each year the Connecticut Alumni Club awards scholarships to students from the State of Connecticut who have achieved a high academic average in their freshman year and have demonstrated financial need. The scholarships are to be used toward the tuition expense of the sophomore year. These scholarships were established in 1958 to promote Northeastern University among the preparatory schools of Connecticut.

**John W. Dargavel Foundation Scholarship**

Pharmacy

This scholarship was established in 1964 by the John W. Dargavel Foundation, sponsored by the National Association of Retail Druggists. The award is limited to students who have completed their sophomore year in the College of Pharmacy.

**Luis de Flores Endowment Fund**

All Colleges

This fund was established in 1964 to provide yearly awards to students in recognition of superior ingenuity, irrespective of general academic standing.

**Agnes F. Driscoll Scholarship Fund**

All Colleges

This fund will provide scholarship assistance to students in their upper-class years who have demonstrated financial need and scholastic attainment.

**Electrical Manufacturers Representatives Club  
of New England, Inc., Scholarship**

Electrical Engineering

Established in 1958, this scholarship of \$475 is granted to a student or students majoring in electrical engineering, without regard to race, creed, or color. To qualify, students must have real financial need and excellent scholastic standing.

**Carl Stephens Eli Alumni Scholarships  
Elmer H. and Daisy M. Everett Scholarship**

(For description of these two scholarships, see page 53.)

**Clara and Joseph F. Ford Scholarship**

All Colleges

In 1947 friends and employees of Clara and Joseph F. Ford united to provide tuition scholarships for worthy, needy, and well-qualified students who have demonstrated a democratic and tolerant spirit and who are well disposed toward people of all creeds and races.

**Gilman Brothers Inc. Scholarship**

Pharmacy

This scholarship of \$250 is given annually by Gilman Brothers Inc. to help a student further his education in pharmacy.

**Rabbi Myer O. Grunberg Scholarship**

All Colleges

Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to that man or woman student who has evidenced in personal, business, and student relations those characteristics of leadership and human relations which make for a better social order. There is no restriction as to race, creed, color, or sex.

**Health Professions Scholarship Program**

Pharmacy

Under a grant from the Public Health Service, annual scholarships not in excess of \$2,500 may be awarded to students from low-income families who, without such financial assistance, could not pursue a course of study in the health professions. The scholarships are available to middlers, juniors, and seniors in the College of Pharmacy.

**Joseph Anthony Johnson Scholarships**

Engineering

Established in 1968 by the will of the late Joseph Anthony (Johansen) Johnson of the Class of 1928, the income provides scholarship aid for students enrolled in the Department of Mechanical Engineering, with preference given to students of Scandinavian origin.

**Vena Morse Lamson Scholarships**

All Colleges

These scholarships are provided through the income of a fund established

in 1963 by Horatio W. Lamson in memory of his beloved wife. The scholarships are awarded annually to needy and worthy students who are enrolled in any of the Basic Colleges of the University. The scholarships are granted by the Committee on Financial Aid of the University without regard to national origin, sex, race, or creed.

**Avrom Aaron Leve Memorial Scholarship**

Psychology

This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former Assistant Professor of Psychology. The interest is used annually to provide scholarships for upper-class students majoring in psychology. The award is made on the basis of academic achievement, financial need, and character.

**George T. Marvin Scholarship Fund**

All Colleges

This fund was established in 1961 under the provisions of the will of George T. Marvin, a graduate of the Northeastern University School of Law, Class of 1918. Mr. Marvin designated that the income of this fund should be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern University.

George T. Marvin Scholarships may be awarded to new students seeking admission to Northeastern and to students enrolled as freshmen and upper-classmen. Applicants must have satisfactory records of scholarship as of the time of making application and must demonstrate genuine need and good citizenship.

**Massachusetts State Pharmaceutical Association Scholarship**

Pharmacy

This scholarship of \$200 established by the Massachusetts State Pharmaceutical Association, is awarded annually. The recipient must be a resident of Massachusetts.

The Massachusetts State Pharmaceutical Association also awards a number of scholarships of \$100. Applications for these scholarships may be secured from the office of the Association at 11 Beacon Street, Boston.

**McKesson & Robbins, Inc., Scholarship**

Pharmacy

This scholarship of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student in financial need.

**Frederick W. Muckenhaupt Scholarship**

All Colleges

This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhaupt in memory of their son, Frederick W. Muckenhaupt, Class of 1959 of the College of Engineering.

The award is to be made annually to a student in good standing on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

**Muro Pharmacal Laboratories, Inc. Scholarship Award Fund**

Pharmacy

This scholarship award fund was established in 1970 by Mr. Samuel J. Rosenberg, President of Muro Pharmacal Laboratories, Inc. A \$100 award will be

made annually to a qualified entering freshman or upper-class student in the College of Pharmacy who demonstrates the need for financial aid.

### **The New England Paper Merchants, Inc., Scholarship**

All Colleges

Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his cooperative work achievement and his extracurricular activities an interest and potential in the field of sales. The recipient must be of high character, must be able to demonstrate financial need, and must have a good academic record.

### **Norfolk County Pharmaceutical Association Scholarship**

Pharmacy

This scholarship of \$50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington).

### **Physical Therapy Traineeships**

Boston-Bouvé

(See section describing Federal Programs.)

### **Pilot Freight Carriers Scholarship**

Business Administration

The Pilot Freight Carriers Scholarship is awarded annually to an upper-class student of Business Administration who has achieved an outstanding academic record and who is interested in a career in the field of transportation. The amount of this award is \$500.

### **Reserve Officers' Training Corps Scholarship Program**

(See section describing Federal Programs.)

### **The Mildred A. Reardon Scholarship Award**

All Colleges

Delta Pi Alpha Sorority sponsors an annual award of \$100 to a deserving under-class woman in the Basic Colleges. Selection is made by the Dean of Women on the basis of financial need and academic standing. The award is given in honor of an outstanding alumna of Northeastern and Delta Pi Alpha, whose academic excellence, strength of character, and qualities of leadership have typified the ideal for which the sorority strives.

### **Frank B. Sanborn Scholarship Fund**

Engineering

The Frank B. Sanborn Scholarship Fund was established in 1958 to provide a scholarship or scholarships of not more than \$500 to worthy and needy students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference being given to students majoring in electrical, mechanical, civil, or industrial engineering, in the order stated.

Each recipient must be willing to assume a moral obligation to reimburse the fund as he may be able, in order to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.

**Clinton H. Scovell Scholarships**

Boston-Bouvé

Scholarships are made available annually to students in Boston-Bouvé College through a fund provided by the will of Clinton H. Scovell.

**John Stuart Sousa, Jr. Memorial Scholarship Fund**

Pharmacy

This scholarship was established in 1968 in memory of John S. Sousa, Jr., of Fall River, Massachusetts, a student in the College of Pharmacy, Class of 1969, by his family and friends. The scholarship is awarded annually with selection preference given to a male student entering his senior year in the College of Pharmacy who has obtained a cumulative quality point average of 2.300, demonstrates financial need, participates in extracurricular activities and preferably is a member of a fraternity.

**William Lincoln Smith Scholarship Fund**

Electrical Engineering

The fund was established in 1947 by Farnham Wheeler Smith, Class of 1924, Benjamin Lincoln Smith, Class of 1923, Thomas Hollis, Jr., Class of 1941, and other members of the family in honor of Dr. William Lincoln Smith, who served long, faithfully, and with distinction as Chairman of the Department of Electrical Engineering at Northeastern University.

The income from the fund is used for an annual scholarship award to a student enrolled in the Department of Electrical Engineering who has demonstrated excellence in some aspect of electrical research, stands high in his courses, or otherwise exhibits promise of future competence in the field. The award shall preferably be granted to a student who needs financial assistance to continue his college work.

**South Middlesex Pharmaceutical Association**

Pharmacy

This tuition scholarship of \$100 established in 1960 is awarded annually to a pharmacy student enrolled in the third, fourth, or fifth year who is in good scholastic standing and in financial need, and living in the area covered by the South Middlesex Pharmaceutical Association (Arlington, Belmont, Lexington, and Watertown). The recipient will be selected by the Scholarship Committee.

**South Shore Pharmaceutical Association Scholarship**

Pharmacy

The Scholarship Committee of the Association will select a freshman student in June of each year living in the area covered by the South Shore Pharmaceutical Association (Quincy, Braintree, Weymouth, Hull, Randolph, Hingham, Holbrook, and Cohasset) who will be awarded a \$100 scholarship to be applied to the tuition of the first semester of the sophomore year.

**Springfield Druggists' Association Scholarship**

Pharmacy

A scholarship of \$100 is offered by the Springfield Druggists' Association. This is to be awarded to a sophomore or junior who maintains the highest average in the Department of Pharmacy, and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

**Ruth Page Sweet Scholarship Fund**

Boston-Bouvé

This fund was established in 1959 by members of the Class of 1919 and alumnae of the Bouvé-Boston School in honor of their classmate, Miss Ruth Page Sweet, dean of the school from 1929 to 1946, administrative director from 1946 to 1948, and director from 1948 to 1958. The scholarship is presented to a junior or senior who has demonstrated by his or her academic record and extracurricular activities a high level of professional promise.

**A. Gilbert Tenney Scholarship Fund**

Engineering

This fund is in memory of A. Gilbert Tenney, who served as a captain in the Air Force during the Korean War and was killed while in active service.

The income from the fund will be awarded to a needy student or students in the field of electrical engineering, studying under the Cooperative Plan of Education.

**Charles Irwin Travelli Scholarships**

All Colleges

Numerous scholarships have been given yearly since 1950 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are named as recipients of Travelli Scholarships at the completion of their sophomore year. Under normal circumstances these awards will continue through the senior year.

**Samuel Ulman Scholarship Fund**

All Colleges

This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The purpose of the fund is to provide scholarship assistance to students in good academic standing who have financial need.

**Uniroyal Foundation Scholarships**

Engineering, LA, BA

The Uniroyal Foundation has established scholarships to be awarded to students in the Colleges of Engineering, Business Administration, and Liberal Arts who qualify on the basis of leadership and character, academic performance and potential, need for financial assistance, and demonstration of interest in a career in industry.

Recipients assume a moral obligation to repay at least 25 per cent of any scholarship received to the University Scholarship Fund after graduation. Students must have completed at least two years of their undergraduate program to be eligible.

**University Scholarships**

All Colleges

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.



**Henry E. Warren Scholarships**

All Colleges

Established in 1958 by the Warren Benevolent Fund, Inc. The purpose of these scholarships is to encourage students to gain cooperative work experience reinforcing study in their major field.

Scholarship awards in the total amount of \$1,000 are awarded annually without restrictions as to race, creed, or national origin, to upper-class students in fields in which related cooperative work positions are few or poorly paid. The recipients of the scholarship must have demonstrated good scholastic standing, fine character, and financial need.

**The Jacob Wasserman Scholarship Fund**

Pharmacy

Established in 1966 by his friends in memory of Jacob Wasserman, this fund is to provide scholarship aid to a senior student in the College of Pharmacy. The award will be made annually on the basis of financial need, academic performance, and personal qualities.

**Western Electric Fund Scholarship Award**

Engineering

This scholarship, established in 1956, is awarded annually to an upper-class student in mechanical, electrical, or industrial engineering. The recipient must be an outstanding student who also has financial need. The Western Electric Company is the manufacturing company for the Bell Telephone System.

**State Scholarship Programs**

The Commonwealth of Massachusetts provides scholarship aid to Massachusetts students pursuing full-time day programs of study in an accredited college or university. Awards are made in the summer of each year, and applications for entering freshmen are available in December through their high school guidance office. Out-of-state students should investigate aid programs in their respective states also. Substantial state aid is offered by Connecticut, New Jersey, Pennsylvania and Rhode Island. The Office of Financial Aid strongly advises aid applicants to apply to state scholarship programs at the same time that they apply for aid from the University.

**FEDERAL PROGRAMS**

Please note that aid granted from programs sponsored by the Federal Government is dependent upon the amount of funds allocated to Northeastern.

**College Work-Study Program**

This is a program of part-time employment under the sponsorship of the Federal Government. It is designed to help full-time undergraduate students meet their educational expenses. Students may work up to 15 hours weekly while attending classes or up to 40 hours weekly during vacation or summer periods. The basic rate is \$1.80 per hour, although as much as \$3.00 per hour may be paid for highly specialized work. Eligible students may work for the University or for public or private non-profit off-campus agencies. The Office of Financial Aid has the responsibility of placing qualified students in their job assignments.



## **Educational Opportunity Grants**

As part of the Federally supported programs administered by the University, Educational Opportunity Grants will be available to a limited number of undergraduate students with exceptional financial need who require these grants to attend college. To be eligible, the student must also show academic or creative promise.

Eligible students who are accepted for enrollment or who are currently enrolled in good standing, may receive Educational Opportunity Grants for a maximum of four years of their higher education.

Grants will range from \$200 to \$1000 a year, and can be no more than one half of the total assistance given the student. As an academic incentive to students, an additional award of \$200 may be given to those students who were in the upper half of their college class during the preceding academic year.

## **Guaranteed Loan Program**

The major objective of this program is to make loan insurance available to any college student who wants to borrow. Under this program a student enrolled for at least one-half the normal academic work load may borrow from a bank or other financial institution. A graduate student may borrow as much as \$1,500 a year; an undergraduate, as much as \$1,000.

A student from a family with an adjusted income of less than \$15,000 a year pays no interest while he is in the University. Repayment of principal and interest begins when the student has ceased his course of study. At that time the Federal Government pays approximately one-half the interest and the student the remainder. A student from a family with an adjusted income higher than \$15,000 a year pays the entire interest on the loan, but he may borrow under the Guaranteed Loan Program at 6 percent simple interest.

Students may obtain additional information and the necessary application forms from the Financial Aid Office.

## **Health Professions Scholarship**

This program is available to full-time students accepted for a course of study leading to a Bachelor of Science degree in Pharmacy. Applicants must evidence exceptional financial need and academic promise. The maximum grant allowable is \$2500 for one academic year.

## **Health Professions Loan**

This program is available to full-time undergraduate students who have been accepted for a course of study leading to a Bachelor of Science degree in Pharmacy. A student who evidences financial need and academic promise may borrow as much as \$2000 per academic year. Repayment of principal and interest does not begin until three years after the student ceases to pursue a full-time course of study. The repayment of the principal may be extended over a ten-year period with interest at the rate of 3 percent per annum.

**Law Enforcement Assistance Administration**

The Law Enforcement Assistance Administration, U.S. Department of Justice has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University loans up to \$1800 per year for tuition and grants up to \$200 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at Federal, state or local level.

The grants are available to full-time or part-time students in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of the government agency employing such applicant for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid.

**National Defense Student Loans**

National Defense Student Loans are granted from funds made available jointly through the United States Congress and through the University.

Applicants must be United States citizens or permanent residents of this country. Applications for such loans are made on a year-to-year basis, and the amount of each loan will be based on the University's estimate of financial need and the funds available for distribution at the time. No interest is charged on these loans until one year after graduation, at which time a 3 percent interest rate is applied. The loan is to be repaid in equal installments over a ten-year period after graduation, but may be repaid at an earlier date. A student may cancel a portion of the loan for full-time employment as a teacher in a public or private and non-profit elementary and secondary school and institutions of higher learning.

**Nursing Scholarship Program**

This Federal program is available to full-time students accepted for a course of study leading to an Associate or Bachelor of Science degree in Nursing. Applicants must evidence exceptional financial need and academic promise. The maximum grant allowable is \$1500 for one academic year.

**Nursing Student Loan Program**

This program is designed for full-time undergraduate students who have been accepted for a course of study leading to an Associate or Bachelor of Science degree in Nursing. Providing financial need is evident, a student may borrow as much as \$1500 per year up to a maximum amount of \$6000 for his entire undergraduate education. Repayment and interest on these loans do not

begin until nine months after the student ceases to pursue a full-time course of study. The repayment of the principal may be extended over a ten-year period with the interest at the rate of 3 percent per annum.

Cancellation of up to 50 percent of the loan at the rate of 10 percent per year may be allowed for borrowers employed as professional nurses in any public or private non-profit institution. Cancellation of up to 100 percent of the loan at the rate of 15 percent per year may be allowed for borrowers employed as professional nurses in any public or private non-profit institution in an area having a substantial shortage of nurses.

### **Physical Therapy Traineeships**

Undergraduate traineeships in physical therapy are made available to the University through the Department of Health, Education and Welfare. Junior and senior Physical Therapy majors recommended by the faculty may receive substantial financial awards which are applied toward their college expenses.

### **ROTC Scholarships**

The Army Reserve Officers' Training Corps Scholarship Program is designed to offer financial assistance to outstanding young men who are interested in the Army as a career. Each scholarship provides for full tuition, fees, and textbooks in addition to pay of \$50 per month, which during one six-week summer training period is increased to \$151.95 per month.

ROTC scholarships at Northeastern are for either a five-year or three-year period. They are awarded to selected entering freshman or students related to financial need, and the earnings of a student during his cooperative work period do not reduce scholarship payments. This award may be supplemented, when necessary, by a scholarship, loan or part-time job.

Applications for entering freshmen must be submitted prior to March 1 for the following school year. Information on the ROTC Scholarship Program may be obtained by writing to the Professor of Military Science, Northeastern University.



# honor societies and academic awards

## HONORS AND AWARDS

The University encourages the achievement of excellence in scholarship by making monetary awards and chartering honor societies in the various academic disciplines.

### *Honor Societies*

Eighteen honorary societies are chartered in the Colleges:

**Phi Kappa Phi** — national interdisciplinary honor society

**Tau Beta Pi** — in the College of Engineering (Massachusetts Epsilon Chapter)

**Nu Chi Epsilon** — in the College of Engineering, Department of Chemical Engineering

**Eta Kappa Nu** — in the College of Engineering, Department of Electrical Engineering (Gamma Beta Chapter)

**Pi Tau Sigma** — in the College of Engineering, Department of Mechanical Engineering (Northeastern Tau Kappa Chapter)

**Phi Alpha Theta** — in the College of Liberal Arts, History Department (Northeastern Zeta Tau Chapter)

**Pi Sigma Alpha** — in the College of Liberal Arts, Political Science Department (Northeastern Delta Gamma Chapter)

**Alpha Pi Mu** — in the College of Engineering, Department of Industrial Engineering

**Chi Epsilon** — in the College of Engineering, Department of Civil Engineering

**Kappa Delta Pi** — in the College of Education

**Beta Gamma Sigma** — in the College of Business Administration (Massachusetts Delta Chapter)

**The Academy** — in the College of Liberal Arts

**Alpha Kappa Delta** — in the College of Liberal Arts, Sociology Department

**Rho Chi Society (Beta Tau Chapter)** — in the College of Pharmacy and Allied Health Professions

**Delta Phi Alpha** — national German honor society

**Beta Alpha Psi** — Accounting fraternity (B.A.)

**Phi Sigma** — in the Department of Biology

**Boston-Bouvé Honor Society** — in the College, with honors in Physical Therapy, Health and Physical Education, and Recreation Education

Election to the college honorary societies is based primarily upon scholarship, but, before a man or woman is privileged to wear the honorary society insignia, there must be evidence of an integrity of character and an interest in the extracurricular life of the University. The societies have memberships consisting of the outstanding men and women in the Colleges. Election to an honorary society is the highest honor that can be conferred upon an undergraduate.

### *Awards For Upperclassmen*

University awards are determined by scholastic and citizenship achievement. They are presented by appropriate committees headed by the Dean of Students and do not require a demonstration of financial need or formal application.

#### **The Academy Award**

Liberal Arts

The Academy, the honor society of the College of Liberal Arts, offers annually an award of \$100 to the sophomore in the College of Liberal Arts who, during the previous year as a freshman, made the highest scholastic record.

#### **William Jefferson Alcott, Jr., Award**

This award of \$200 was established in 1934 by members of the faculty and other friends to perpetuate the memory of William Jefferson Alcott, Jr., a brilliant member of the Northeastern Department of Mathematics from 1924 until his death in 1933. The award to a senior is made annually from the income of the fund "for outstanding performance, either in the way of unusual excellence in routine work, or in connection with some intellectual activity outside or beyond the requirements of the curriculum."

#### **Alumni Awards for Professional Promise**

All Colleges

Established in 1947 by the Alumni Association, these awards are presented annually at a final senior class meeting in the spring of the year. The awards are made to the outstanding seniors in each of the Basic Colleges who have demonstrated unusual professional promise through their character traits, scholastic achievement, and cooperative work performance.

#### **The Beta Gamma Sigma Society Award**

Business Administration

The Massachusetts Delta Chapter of Beta Gamma Sigma, the national honorary society of colleges of business administration, offers an annual scholarship of \$100 to the sophomore in the College of Business Administration who, during the previous year as a freshman, made the highest scholastic record.

#### **Boston-Bouvé Honor Society Award**

Boston-Bouvé

The Society offers an annual award of \$100 to the sophomore in Boston-Bouvé College who, during the previous year as a freshman in the College, made the highest scholastic record.

#### **Cooperative Education Awards**

All Colleges

These awards are presented to seniors in each of the Basic Colleges in recognition of outstanding performance in the Cooperative Education Program,

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through which they have personified the objectives and ideals of the University. The awards are presented at the Annual Awards Luncheon.

### **Sears B. Condit Honor Awards**

All Colleges

These awards were established in 1940 through the generosity of Sears B. Condit. At Honors Day Convocation, Sears B. Condit Honor Awards, approximately 40 in number, are awarded annually to outstanding students in the senior class. Each award carries a stipend of not less than \$150 as well as a certificate of achievement.

### **Alfred J. Ferretti Award**

Engineering

Tau Kappa Chapter of Pi Tau Sigma, the Mechanical Engineering National Honor Fraternity, sponsors an annual award to the sophomore mechanical engineering student at Northeastern having the highest scholastic standing. The award is named in honor of Professor Ferretti, who retired June 30, 1961, after 43 years of service to the University.

### **The Harold D. Hodgkinson Achievement Awards**

All Colleges

Established in 1954, the Harold D. Hodgkinson Achievement Awards of \$500 each are granted annually to a senior student in Division A and Division B. The winners of the awards are known as the Hodgkinson Scholars for the year in which they are chosen.

The award is based primarily upon distinguished scholastic achievement with due consideration of character, personality, qualities of leadership, co-operative work experience, military record (if any), and service in voluntary organizations and activities. Student leadership accomplishments and professional potential are evaluated in connection with these criteria.

The Hodgkinson Scholar is chosen by a committee of administrative members of the faculty. An appropriate certificate is presented to each recipient as a permanent record of his selection.

### **Kappa Delta Pi Award**

Education

Kappa Delta Pi, the College of Education honor society, offers an annual award of \$100 to the education sophomore who, during the freshman year, achieved the highest scholastic record.

### **The Lilly Achievement Award**

Pharmacy

The Lilly Achievement Award is given to a graduating senior for superior scholastic and professional achievement. Leadership qualities, professional attitudes, and academic performance will be considered in the selection of the individual for this award.

### **Julia and Merrill Robert Lovinger Award**

All Colleges

This annual \$100 award was established in 1960 by William Lovinger for the purpose of giving assistance to a student of acceptable scholastic standing who can demonstrate financial need.

### **Robert Lubets Award**

Business Administration

The award was established in 1953 by the Boston accounting firm of Robert



Lubets & Company to recognize outstanding professional development and personal growth by students training for careers in accounting. One hundred dollars will be awarded to that degree candidate who at the completion of his junior year has demonstrated the greatest personal growth and professional development as evidenced by his improvement in scholastic achievement accompanied by professional aptitude indicative of future success as an accountant.

#### **Ruth E. Phalen Memorial Award Fund**

All Colleges

This fund was established in 1959 by Thomas E. Phalen, Jr., a member of the faculty, in memory of his wife. The income from this fund is used yearly as a cash award to a senior, junior, or middler, preferably in the College of Engineering, who maintains at least a 2.0 academic average, shows outstanding ability in one or more varsity sports, and demonstrates excellent campus citizenship.

#### **The Phi Sigma Society Award**

Liberal Arts

Phi Sigma, honor society in the Department of Biology, offers an annual award of \$50 to the junior or senior majoring in biology or a related science who demonstrates the greatest research potential. To qualify for the award, the student must be a member of Phi Sigma.

#### **Roland Guyer Porter Memorial Fund**

Electrical Engineering

This fund was established in 1953 by colleagues and friends of the late Professor Roland G. Porter, for many years head of the Department of Electrical Engineering. Interest from the fund provides an annual award to a student in the Department of Electrical Engineering who best exemplifies the qualities of mind and character which Professor Porter did so much to develop in his lifetime.

#### **President's Awards**

All Colleges

Since 1929, at the annual Honors Day Convocation, four awards of \$100 each, known as the President's Awards, have been presented to the students with the outstanding records in the sophomore, middler, junior, and senior classes.

#### **The William Rand Award**

Engineering

The Massachusetts Epsilon Chapter of Tau Beta Pi offers annually an award of \$50 to the outstanding middler in the College of Engineering. The award is based upon outstanding scholarship, breadth of interest, and contribution to the University. All middleers with a 3.5 average or above are eligible; and the winner is chosen after careful screening and interviews with members of the chapter.

#### **ROTC Awards**

ROTC

Awards totaling \$1,000 are available to ROTC cadets each year. The University offers ten \$50 awards annually. They are: four to sophomores, four to middleers, and two to juniors.

## 72 / HONOR SOCIETIES AND ACADEMIC AWARDS

Scabbard and Blade (the cadet officers' honorary society) offers one award annually to middlers. The Pershing Rifles (the basic course honorary society) offers a \$50 award to a sophomore Pershing Rifles cadet.

Academic Achievement Awards are won by each cadet in the top 10 percent of ROTC classes. This award, a wreath, is worn above the right breast pocket of the uniform during the year immediately following. Leadership Achievement Awards, consisting of letters of commendation, are awarded to each cadet in the top 10 percent in leadership potential.

Many medals and trophies are also awarded by other organizations to ROTC cadets for achievements in diverse fields.

### **Tau Beta Pi Award**

Engineering

Massachusetts Epsilon Chapter of Tau Beta Pi Association, national honorary society in engineering, offers annually a scholarship of \$100 to the sophomore in the College of Engineering who, during the previous year as a freshman, made the highest scholastic record.

### **Woman of the Year Award**

All Colleges

The women's societies of the University sponsor an annual scholarship of \$100 to the senior woman student who, by high scholastic attainment and by demonstration of the quality of leadership, has proven herself the outstanding woman student of the year.



# student activities

Northeastern University regards student activities as an integral part of its threefold educational program along with academic and cooperative education. The purpose of the Northeastern activities program is to provide all students with a variety of opportunities for experience, training, recreation, and spare-time interests. By participating in activities, students add to their education and personal development, build up an asset which may be as important upon graduation as their academic record, and make a significant contribution to the University.

## ATHLETICS

The University recognizes as major sports for men: baseball, basketball, cross-country, football, skiing, track, hockey, golf, and crew. Minor sports teams are active in sailing and riflery. The women's intercollegiate athletic program, administered under the Women's Athletic and Recreation Association, includes basketball, field hockey, lacrosse, skiing, swimming and diving, tennis, and volleyball. Intramural sports are organized for both men and women.

## ARTS

Participation in the creative arts is encouraged through the Art Club; Band Chamber Orchestra, Chapel Choir, Chorus, and Early Music Players; Silver Masque (major dramatic productions) and Studio Theatre.

## PROFESSIONAL ORGANIZATIONS

**The College of Engineering** sponsors student chapters of the following:

- American Society of Mechanical Engineers
- American Society of Civil Engineers
- American Institute of Chemical Engineers
- American Institute of Industrial Engineers
- Institute of Electrical and Electronics Engineers
- Society of Women Engineers

**The College of Business Administration** offers participation in the student chapters of national organizations in the following fields: Accounting, Advertising, Finance, Marketing, and Management.

## 74 / STUDENT ACTIVITIES

**The College of Liberal Arts** sponsors the following clubs: Anthropology, Biology, Chemistry, Debate, History, Journalism, Mathematics, Physics, and Sociology.

**The College of Education** sponsors the Student Chapter of National Education Association.

**The College of Pharmacy and Allied Health Professions** recognizes the Student Chapter of the American Pharmaceutical Association and five professional fraternities and sororities.

**Boston-Bouvé College** has student chapters of the American Association for Health, Physical Education, and Recreation, and the American Physical Therapy Association.

### PUBLICATIONS

**Cauldron:** The Senior Class annual is prepared throughout the year and distributed without charge to seniors preceding Commencement. Members of all colleges and classes are eligible for the staff. The CAULDRON provides opportunities for photographic and editorial experience.

**Northeastern News:** The award-winning University weekly paper is produced entirely by students. A large staff is selected from applicants of all colleges and classes. Freshmen are encouraged to participate. An intern training program prepares students for advancement and election to the NEWS Board.

**Spectrum:** The University literary magazine publishes creative student writing selected by an Editorial Board. It is professionally printed and sold throughout the University.

### RELIGIOUS ORGANIZATIONS

Although the religious life at Northeastern emphasizes the interfaith and ecumenical spirit, denominational student organizations are given full support on campus. Each group has its chaplain, its officially appointed faculty adviser, and its student officers. The activities and special programs of these clubs, representing a wide diversity of creeds, are coordinated by the Interfaith Council.

### SOCIAL ORGANIZATIONS

The University has chartered some fifteen fraternities, five sororities, and a number of other Greek Letter social groups, both national and local.

Other groups primarily social or for school spirit and service are the Student Union and the Husky Key, WRBB Radio Station, and the Hus-Skiers and Outing Club.

### STUDENT GOVERNMENT

**Class Boards:** Each class has an elected class board which is the governing body of the class. From this Board the various class officers are chosen: President, Vice President, Secretary, and Treasurer. A fifth member is an ex-officio member of the Student Council and is assigned to represent his class.

**Student Council:** The Student Council is a group of 90 elected representatives of all undergraduates enrolled in the several colleges of Northeastern University, who serve as a legislative-advisory body for the consideration of problems and policies affecting the entire student body.

The Council is the official liaison between the students and the University administration. In certain areas of student affairs, the Council serves as a legislative body. In areas involving academic policies, which are primarily the concern of the faculty, the Council serves as an advisory body.



# reserve officers' training corps

## General Objectives

The Department of Military Science is the instructional department of the University which administers the Army Reserve Officers' Training Corps (ROTC) Program. The Reserve Officers' Training Corps is regarded by Northeastern University as an integral part of its educational program, and is made available on a voluntary basis to all male students who are otherwise qualified. The University encourages enrollment in the belief that the leadership, citizenship, and military training available to students taking ROTC is beneficial in their overall development as future leaders.

The Reserve Officers' Training Corps of the United States Army exists for the purpose of developing officers—leaders of men. It offers courses of instruction leading to a commission as a second lieutenant in the United States Army Reserve or the Regular Army. The mission of ROTC is to have ready in time of national emergency a corps of educated, trained military leaders for our nation. Our Northeastern ROTC is an Army, Senior Division, Class CC (Civilian College) unit.

The staff and faculty of the Department of Military Service consist of Department of the Army assigned officers, noncommissioned officers, and civilians assigned by the University. Officers are individually nominated for assignment to the University and are assigned only after records have been reviewed and each individual has been accepted by the University.

## Courses of Study

The program of instruction consists of a Basic Course and the Advanced Course. The Basic Course (MS I and MS II), taken during the freshman and sophomore years, includes instruction common to all branches of the Army. The Advanced Course (MS III and MS IV) is presented during the middler, junior, and senior years. Graduates of the Advanced Course receive commissions as second lieutenants in the U.S. Army Reserve or Regular Army.

## Enrollment in the ROTC Basic Course

Enrollment in the ROTC Basic Course is voluntary and is open to all male students of the Basic Colleges who are physically qualified. Students may withdraw from the Basic Course at any time during their freshman or sophomore

year. The Basic Course may be entered only at the beginning of the freshman year except for veterans and certain students who have had Junior ROTC, for whom a portion of the Basic Course may be waived.

### **Eligibility for the Advanced Course**

The ROTC Advanced Course is available to male undergraduate students of the Basic Colleges who complete the Basic Course, to honorably discharged veterans whose service may be substituted for the Basic Course, or to students who complete a summer camp of 6 weeks following their sophomore year (since the cooperative program precludes regularly enrolled students' attending this camp, this method of qualifying for the ROTC Advanced Course will in most cases apply only to transfer students) if:

- (1) they are citizens of the United States and will not have reached 28 years of age at the time of commissioning;
- (2) they successfully complete such survey and general screening tests as may be prescribed;
- (3) they have three academic years to complete for graduation (two for full-time students);
- (4) they are selected by the Professor of Military Science and the University;
- (5) they successfully complete a U.S. Army physical examination;
- (6) they execute a written contract with the Government; and are sworn into the Army Reserve.

### **Eligibility for ROTC Flight Training**

This training is available during the senior year to specially selected cadets who successfully complete U.S. Army Aviation aptitude and physical tests. Flying instruction is conducted on an extracurricular basis by a civilian flying school under contract to the U.S. Army. An Army faculty member supervises the program. Cadets successfully completing the course may receive a Federal Aviation Agency Private Pilot's Certificate.

### **Veterans**

Honorably discharged veterans (enlisted) may be enrolled in ROTC with one or both years of the Basic Course waived, depending on prior service. They must be co-aligned in ROTC with other members of their class in the University curricula. Veterans are a distinct benefit to the Corps of Cadets because their actual experiences lend color to the program and help to orient cadets without service. They are especially desired and are normally appointed cadet officers upon enrollment. Certain credits are available to veterans depending upon service. Former commissioned officer veterans are not eligible for ROTC.

### **Transfer Students**

A student transferring to Northeastern University from another institution where he has been enrolled in an ROTC program similar to that at Northeastern is allowed credit for his work. The student's records are obtained from his former professor of military science. Such a transfer student must be co-aligned in ROTC with other students in his class.

Students transferring to Northeastern University as middlers, without previous ROTC training, may enroll in the Advanced Course providing they attend a six-week summer camp prior to the start of the middler year.

Students transferring to Northeastern University as sophomores may also enroll in ROTC as middlers providing they satisfactorily complete a six-week summer camp prior to the start of the middler year. Application should be made to Department of Military Science no later than March 1.

Transfer students may obtain complete information and assistance from the Department of Military Science.

### **Uniforms and Equipment**

An Army uniform is issued without cost to ROTC students in the Basic Course. Advanced Course students are individually fitted with a uniform, which becomes their personal property upon commissioning, and they continue to wear it as an officer after graduation. All other equipment, textbooks, etc., required for instruction are provided without charge throughout the five-year program. These items remain the property of the Government, and the students must safeguard them and use them in accordance with University and ROTC regulations. A \$10 deposit is required temporarily from all Basic Course students enrolling in ROTC until uniforms and property are returned in good condition. Any loss or damage to ROTC uniforms and equipment, exceeding the deposit, will be charged to the student.

### **Academic Credits**

The Basic Course may be substituted for physical education as a prerequisite for graduation. Regulations of the individual Basic Colleges prescribe the number of hours of academic credit granted.

### **Pay and Scholarships**

All Advanced Course cadets are paid \$50 monthly during actual Advanced Course instruction, a total of \$1,000 during the three years. Camp pay is approximately \$300.00, over and above housing, messing, and medical care, which are free at camp. Transportation to and from camp is paid at the rate of \$.06 per mile.

The Army offers full-tuition scholarships for varying number of years to selected students. For further information see chapter on Financial Aid.

### **Draft Deferments**

Public Law 51 (Universal Military Training and Selective Service Act of 1951 as amended by the Reserve Forces Act of 1955) permits students enrolled in ROTC, who are expected to attain appointments as commissioned officers in the Army Reserve, to be deferred from service for as long as they remain in good standing. ROTC deferment remains in effect until graduation or withdrawal from the University.

### **Distinguished Military Students**

There are military honors for ROTC graduates similar to academic honors for regular graduates. Honor graduates of ROTC are called Distinguished Military Graduates. If they are physically qualified and apply for it, they may be commissioned in the Regular Army instead of the Army Reserve, and enter into a Regular Army career on the same basis as graduates of the United States Military Academy at West Point. This is a splendid opportunity for those who are interested in the many advantages of a Regular Army career.

Cadets are eligible for designation as Distinguished Military Students in their junior year if they possess outstanding qualities of leadership, high moral character, and definite aptitude for the military service; have attained an academic standing in the upper half of their college class and in the upper third of their ROTC class; and further, have demonstrated leadership ability through participation in recognized campus activities.

### **The Army as a Career**

By following any curriculum leading to a degree, and by completing the ROTC Program, a student may qualify for a full-time career in the Regular Army. Cadets who have been designated Distinguished Military Students may apply for an appointment in the Regular Army. Notification of selection is made by mid-December of their senior year. They then become Regular Army officers with all conditions and opportunities for graduate education, on the same basis as graduates of the U.S. Military Academy at West Point.

An Army career as a Reserve Officer on extended active duty also is possible. Many graduates do not request a Regular Army appointment originally, but find the Army enjoyable and satisfying while serving their obligated tours of active duty. Those officers who request continuation and are accepted, serve in the Active Army as Reserve Officers, with the same pay, responsibilities, retirement benefits, and opportunities for promotion as Regular Army officers.

## **MILITARY SCIENCE FACULTY**

### **Professor**

Richard C. Moran, COL, USA; B.S.  
Chairman

### **Associate Professors**

Timothy L. Evans, LTC, USA; B.S.  
Robert D. Sullivan, LTC, USA; M.S.

### **Assistant Professors**

Allan D. Graham, MAJ, USA; B.S.  
Carl V. Lillvik, MAJ, USA; B.S.  
John G. Williamson, MAJ, USA; B.S.  
Richard J. Kelley, CPT, USA; B.A.  
Steven W. Kujawski, CPT, USA; B.S.  
Richard J. Schmus, CPT, USA; B.S.  
Robert W. Whitton, CPT, USA; B.S.

### **Instructors**

Robert F. Higgins, SGM, USA  
Sam G. Cherone, MSG, USA  
Robert F. Gibbons, SFC, USA  
Richard A. Parker, SFC, USA  
Gary W. Roshto, SSG, USA



## Specimen Program in Basic ROTC

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.101	Mil. Sci. I U.S. Defense Establishment	3 1	91.102	Mil. Sci. I American Mil. History	3 1	91.103	Mil. Sci. I Officer Development Leadership Lab	3

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.104	Mil. Sci. II Map & Aerial Photo Reading Intro. to Tactics	3 1	91.105	Mil. Sci. II Small Unit Tactics Leadership Lab	3 1

## Advanced ROTC

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.106	Mil. Sci. III Small Unit Tactics Internal Defense & Development	3 2.5	91.107	Mil. Sci. III Leadership & Management Leadership Lab	(2) 2.5

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.108	Mil. Sci. III Mil. Teaching Principles Operations Intelligence	3 2.5	91.109	Mil. Sci. IV Military Team Leadership Lab	1 (2) 2.5

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.110	Mil. Sci. IV Leadership and Management World Affairs A Strategic Analysis	3 2.5	91.111	Mil. Sci. IV Pre-Camp Serv. Orient. Leadership Lab	1 (2) 2.5



# boston-bouvé college

**Catherine L. Allen, Dean**

In July 1964, its fiftieth-anniversary year, Bouvé-Boston School merged with Northeastern to become one of the eight basic Colleges of the University. This union marked the culmination of a half century of excellence as a woman's institution, with curricula in physical education and physical therapy, and with emphases in health, recreation, winter sports, and camping throughout its history. As a basic College, Boston-Bouvé became coeducational and with the initiation of a new Department of Recreation Education, extended opportunities into three major areas of study. The College offers both the graduate degree of Master of Science in Physical Education, and Master of Science in Recreation Education.

Professional preparation is based in the liberal arts and sciences, with orientation to each profession beginning in the freshman year. There is a concentration on specific essential skills spaced throughout the programs and on professional theory and practice in the last two years. In the upper-class years, all students synthesize knowledge and skills through supervised experiences in clinical practice in Physical Therapy, student teaching in Physical Education, or field experience in Recreation Education.

Leadership training, group dynamics, camp counseling, outdoor education and skills, conservation, recreation and park administration enrich learning in the Warren Center for Physical and Recreation Education, with professional camping as an integral part of the education of young men and women.

The Warren Center serves as a practical laboratory for the College. Its athletic fields and lake, tennis courts, natural setting of woods, fields and streams, winterized cottages and Hayden Lodge provide year-round opportunities for outdoor learning twenty-five miles from the Boston campus. Courses, conferences, seminars and workshops are conducted at the Center throughout the year and thus serve University and community needs.

Professional reading rooms in Dockser Hall and in the Physical Therapy complex in Mary Gass Robinson Hall supplement the Northeastern University library and maintain an up-to-date collection for use by all students and faculty in the College.

Northeastern's five-year Cooperative Plan offers students varied opportunities for earning and learning through alternate terms of work-study experience. Currently, the Physical Therapy program is four years in length. As of 1972-73, Physical Therapy will also be a five-year cooperative plan.

**Admission Requirements**

To be eligible for admission, a candidate must have completed a college preparatory course in secondary school. Rank in class and recommendations of the secondary school administration should be high. Each student's college preparation should include:

<b>Subjects</b>	<b>Units</b>
English (4 years)	3
Mathematics (Geometry and Algebra preferred)	3 or more
Physical Sciences (Biology, Chemistry, Physics)	2 or more
Other college preparatory subjects	<u>7</u>
	15

Biology, Chemistry, Physics are strongly recommended for all Physical Therapy and Physical Education applicants.

Modern Language, Social Science, and Biology are important background subjects for Recreation careers.

Additional requirements basic to the admission of all prospective majors in Physical Education, Recreation Education, and Physical Therapy are: good health, demonstrated ability to work with people, and the physical competence and skills to undertake the prescribed degree program. Full health clearance is required prior to matriculation at the University. In the junior year, all students are examined by physicians in the University Health Services at a moderate fee.

**Graduation Requirements***Degrees*

Students graduating in Physical Education or Recreation Education earn the degree of Bachelor of Science in Education and students in Physical Therapy receive the degree of Bachelor of Science in Physical Therapy. These degrees are awarded to qualified candidates who have completed the curricula as prescribed. Student teaching, field experience and/or clinical practice is an integral part of the curriculum and is required for graduation.

*Quantitative Requirements*

The **quarter hours** required in each curriculum differ. Specifically:

Physical Education	172	quarter	hours
Physical Therapy	167	"	"
Recreation Education	178	"	"

The students must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

Senior year course work and required experiences must be completed in full-time residence at Northeastern University, or in an educational setting approved by the college.

### *Qualitative Requirements*

The overall cumulative quality point averages required to enter each class level are explicitly stated in the Student Handbook. Throughout the professional sequence, students must maintain required averages and demonstrate a high level of personal and professional maturity to continue field practice and to be approved for graduation. Because of accreditation recommendations and differences in curricula, qualitative requirement variations occur:

#### *Departments of Physical Education and Recreation Education*

Students admitted as freshmen are enrolled in the lower division. After completion of 60 credits (inclusive of the term of petition) of acceptable scholarship and performance in the prescribed program, a student may petition for upper division standing. The student must achieve upper division status by the end of Quarter 7 to be eligible to continue.

To achieve upper division standing, students must demonstrate acceptable scholarship by achieving and maintaining minimum overall QPA of 1.850 and a major field QPA of 2.300. Courses included in computing the major field average are determined by each department. Students must also demonstrate adequate health, verbal fluency, essential skills in a specific curriculum, emotional maturity; must complete all required courses; and have a favorable evaluation from related work and/or coop experience.

Transfer students are required to delay petition for upper division standing for one or more academic terms until *competence* to perform adequately in the selected professional program has been demonstrated.

To qualify for field experience and/or student teaching, students must maintain an overall QPA of 2.0 and a major field QPA minimum of 2.300.

#### *Department of Physical Therapy*

Students admitted in the Department of Physical Therapy must maintain acceptable standards of scholarship and performance in the prescribed program. Students must also demonstrate adequate health, verbal fluency, essential skills, emotional maturity; must complete all required courses; and have a favorable evaluation from clinical practice and/or co-op experience.

Cumulative quality point averages of 2.0 overall, and of 2.3 in professional courses are required to enter clinical practice. Also, there is an additional requirement of C or better in 64.121 Gross Anatomy for admission to clinical practice. Students must maintain required cumulative averages and demonstrate high level personal and professional maturity throughout the professional sequence to be recommended for graduation and placement.

### **Transfer Students**

Transfer students may be accepted in the College at upper-class levels. Each transcript is individually assessed for qualification, placement and course design.

### **Graduation with Honor**

Candidates of distinctively superior achievement in academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or highest honor. Students must have been in attendance at the University at least six quarters before they become eligible for honors at graduation.

### **Accreditation**

All programs in the College are unconditionally accredited as clarified in departmental sections of this catalog.

## Department of Physical Education

John W. Fox, Chairman

### FACULTY

#### Professors

John W. Fox, A.B., M.A., Ed.D.  
Kathryn Luttgens, B.S., M.S., Ph.D.

#### Associate Professors

Carl Christensen, B.S., M.S., Ph.D.  
Mary Nicholson, B.S., M.S.  
Jeanne Rowlands, B.A., B.S., M.A.  
Harold A. Walker, A.B.  
Richard C. Zobel, B.S., M.A., Ed.D.

#### Instructors

Glenn A. Boden, B.S.  
Marilyn Cairns, B.S., M.S.  
Judith Roberts, B.A., M.Ed.  
Susan Snyder, B.S.

#### Assistant Professors

Robert S. Curtin, B.S., Ed.M.  
William J. Gillespie, B.S., Ed.M.  
Anson N. Holley, B.S., M.S.  
Evelyn Howard, B.S., M.S.  
Kerkor Kassabian, B.S., Ed.M.  
Martha Knight, B.S., M.A.  
Charles E. Larson, B.S., M.S.  
Jocelyn Leathern, B.S., M.S.  
Barbara Philbrick, B.A., M.S., Ph.D.  
Sarah Robinson, B.S., M.S.  
Douglas Wiseman, B.Ed., M.S., D.P.E.

### PHYSICAL EDUCATION

#### Programs

The Department of Physical Education conducts the undergraduate professional program for students majoring in Physical Education, electives for all university students, the intramural/club program for men and women, and the Women's Athletic and Recreation Association which includes women's varsity competition.

#### Professional Program

The professional program in Physical Education is designed to prepare specialists capable of developing the materials and methods appropriate to teaching physical education in public and private schools at all levels—elementary, secondary and college. Its graduates are qualified as athletic coaches, physical education teachers, directors of athletics, supervisors of physical education, and leaders in YMCA and YWCA and other youth organizations.

Students majoring in this program receive a strong background in general education and liberal arts. Elective hours are required in each of the areas of Science, Social Science, and Humanities. Specialization in Physical Education includes such courses as history, philosophy, principles, curriculum develop-

ment, and class procedures, measurement and evaluation, kinesiology, exercise physiology and perceptual-motor development. Students are well grounded in the techniques of coaching the various individual, dual and team sports, and in adapting these activities to the needs of the handicapped. Because of the close and overlapping relationship among Physical Education, Health, and Recreation, Physical Education majors may take courses and are afforded laboratory experiences in these areas.

The development and demonstration of personal skill in performance and teaching are an integral part of the professional program. Each student is expected to demonstrate a level of personal skill proficiency in one activity from each of these areas: Aquatics, Dance, Gymnastics, Racquet Sports, Individual Activities, Team Sports. The degree of skill may be demonstrated through proficiency testing or by taking appropriate courses from electives offered by Boston-Bouvé College.\* Major students are assigned supervised student teaching responsibilities in elementary and secondary schools throughout the Greater Boston Area. In addition, students increase their experience with children through their cooperative work assignments and as counselors in the summer laboratory camp.

Approximately \$85 is required for physical education uniforms. Fees may be assessed in courses requiring highly specialized equipment, supplies, or off-campus facilities. In the spring quarter of the freshman year there is a required 3-week resident program at the Warren Physical Education and Recreation Center. An additional fee is charged for room and board.

The Department of Physical Education provides a comprehensive academic faculty advising program; however, it is the personal responsibility of the student to ensure that all general education requirements of the curriculum, requirements for the major field of study, and total quarter hours of credit for graduation have been met.

During the senior year, it is the responsibility of the potential degree recipient to make application for graduation in writing to the Dean of the College, or her designate. This must be done within a week after the beginning of the quarter in which the candidate expects to complete the requirements for graduation.

### **Accreditation**

The professional program in Physical Education is accredited by the National Council for Accreditation of Teacher Education (NCATE). Students who qualify may be certified by the National Athletic Trainers Association.

### **Electives in Physical Education**

A broad selection of electives in dance, sports, games, aquatics and gymnastics is offered for all University students. Most classes are coeducational although some are limited to men or to women according to the activity.

Focus in the elective program is placed on the life-time use of sports, dance and aquatics for recreational satisfaction and participation, including the currently popular scuba, fencing and Judo, among others.

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\*To qualify for beginning level dance courses, Physical Education majors must demonstrate elementary competence in rhythmic analysis.

New courses have been added by the request of students, e.g., The Spectator and Sport, Sociology of Sport and Dance, Dance History and Philosophy, Early Childhood Motor Skill Development, Games and Activities for Children, and Perceptual Motor Training Programs.

### **Women's Athletic and Recreation Association**

The Women's Athletic and Recreation Association has, as its prime purpose, the promotion of activity opportunities of an athletic and recreational nature for all undergraduate women students. Throughout the year, intramural and club participation is possible in badminton, basketball, fencing, field hockey, golf, lacrosse, modern dance, speed swimming, synchronized swimming, tennis, and volleyball. Varsity athletic teams for women include basketball, field hockey, gymnastics, lacrosse, swimming and diving, tennis, and volleyball. Other activities are offered when warranted by student interest and available facilities.

### **Men's Intramural and Extramural Programs**

A comprehensive program of intramural and extramural sports is provided men students through the media of clubs, leagues, and individual participation. Separate leagues are organized for commuters, dormitory and fraternity students. Further information may be obtained in the Office of Intramural Sports, Room 100, Cabot Physical Education Center.

Specimen Program in Physical Education

FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.
62.201	Human Movt.	2(2)	4	30.114	English	4	4	62.249	Physical Science	3	
30.113	English	4	4	18.141	Biology I	3(4)	4	62.203	Group Dyn.		
10.104	Fund. of Math*	4	4	50.112	Soc. Sci. II	4	4		Practicum		
50.111	Soc. Sci. I	4	4		Gen. Study Elect.		4	62.215	Sch. Observ.		(2)
	Prof. Skills Elect.	(2)	1		Prof. Skills Elect.	(2)	1	65.130	Health Prob. of Coll. St.		3
								62.206	First Aid		1(2)
									Prof. Skills Elect.		(2)

SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
62.250	Anat. & Physiol. I	3(2)	4	62.251	Anat. & Physiol. II	3(2)	4
50.121	Human Devel. I	4	4	50.131	Human Devel. II	4	4
	Gen. Studies Elect.		8	50.141	Ed. Meas.	4	4
	Prof. Skills Elect.	(2)	1		Gen. Studies Elect.		4
				62.218	or Elem. Activities	2(4)	4
					Prof. Skills Elect.	(2)	1

THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
62.225	Adapted P.E.	3(2)	4	62.253	Kinesiology	4	4
62.252	Anat. & Physiol. III	3(2)	4	62.260	Meas. & Eval.	4	4
62.221	Percept. & Mot. Learn	3	3	62.210	Hist., Princ., Phil.	4	4
62.275	Critical Teach. Skills	3	3		Gen. Studies Elect.		4
	Prof. Skills Elect.	(2)	1		Prof. Skills Elect.	(2)	1

FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
62.254	Exerc. Physiology	3(2)	4	62.277	Outdoor Teach. Lab.**		2
	Prof. Skills Analysis/Coaching	2(2)	4	62.256	Ath. Train.	2(2)	3
	Gen. Studies Elect.		8	62.218	El. Sch. Activities	2(4)	4
					Prof. Skills Analysis/Coaching	2(2)	4

FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.
	Gen. Studies Elect.	8	62.282	Supervised Student Teaching	8	62.270	Administ.	4
						62.280	Curric. Dev. BBC Elect.	3

\*Student with demonstrated proficiency may choose a general studies elective.  
\*\*Option to waive this requirement considered upon presentation of evidence of comparable experience to appropriate faculty committee.



## Department of Recreation Education

Albert H. McCay, Chairman and Director of The Warren Center

### FACULTY

#### Professor

Albert H. McCay, B.A., M.A., Ed.D.

#### Associate Professor

Howard Jeffrey, A.B., M.A., D.R.

#### Assistant Professors

Reginald Haché, B.M., M.M., A.D.

Richard Morrison, A.B., M.Ed.

Frank Robinson, B.A., M.S.

#### Instructors

Elaine Eliopoulos, B.S.

Maureen Glancy, B.S.

#### Lecturers

Lydia Casavant, B.A., M.S.

Thomas Lyman, B.A.

Mary Alice Queiros, B.S.

### RECREATION EDUCATION

Recreation is a vital profession for a rapidly changing world. Prospects for the future clearly point toward increasing leisure time and more available income. Public recognition of the need for trained administrators, teachers, and trained leaders in recreation programs for people of all ages during all seasons of the year has created new demands for career personnel.

Government agencies and educational institutions are expanding their programs. Recreation opportunities exist in community organizations, schools and youth-serving agencies, churches, settlement houses, and hospitals; in business and industry; in the Red Cross, Peace Corps and the Armed Forces; in camps, resorts, and parks; in departments of recreation in schools and colleges; in new recreation centers developed by youth groups; and in state, regional, and national parks.

The five-year cooperative program of study is based in the liberal arts and sciences, with courses in professional education beginning in the freshman year.

The acquisition of knowledge and skills in arts and crafts, camping, dramatics, music, sports, dance, aquatics, hobbies, and adapted recreation for special groups, is combined with training in leadership, organization, and administration.

Outdoor education, camp counseling, school camping, recreation, and park programming are essential aspects of curriculum, and the Warren Center of Northeastern University offers an excellent and unique teaching-learning laboratory within easy commuting distance of Boston.

Supervised field experiences both indoors and outdoors provide exciting, and at the same time practical, opportunities with children, youth and adults. In addition, the cooperative plan provides seven quarters of practical experience on-the-job in youth agencies, municipal recreation departments, hospitals and institutions, homes for the aging, and other selected settings.

Undergraduates in the Department of Recreation Education may elect any one of three emphases: Community Recreation-Education, Therapeutic Recreation for work with the retarded, the handicapped and the aging, or Outdoor Recreation-Education and Conservation.

The professional program in Recreation Education is accredited by the National Council for Accreditation of Teacher Education (NCATE).

## Specimen Program in Recreation Education

### (Five-Year Cooperative)

**FIRST YEAR**

QUARTER 1			
No.	Course	Cl.	Q.H.
18.141	Basic An. Biology	3(4)	4
29.106	Speech Fund.	3	3
50.111	Soc. Sci.	3	3
63.120	Orient. Rec.	2	2
63.121	Rec. Skills I	(6)	2

QUARTER 2			
No.	Course	Cl.	Q.H.
18.142	Basic An. Biology	3(4)	4
30.113	English	4	4
50.112	Soc. Sci.	3	3
63.122	Rec. Skills II	2(6)	4

QUARTER 3			
No.	Course	Cl.	Q.H.
30.114	English	4	4
50.113	Soc. Sci.	3	3
63.123	Rec. Skills III	2(6)	4
65.129	Health Educ.	3	3

QUARTER 3A			
No.	Course	Cl.	Q.H.
63.125	Outdoor Educ. & Camp Leadership		4

**SECOND YEAR**

QUARTER 4				
No.	Course	Cl.	L.	Q.H.
50.121	Psychology of Learning I	4	—	4
	Elective	4	—	4
63.150	Anatomy and Physiology	2	2	3
63.133	Recreation Skills IV	0	6	2
16.111	Earth Science	4	—	4

QUARTER 5				
No.	Course	Cl.	L.	Q.
63.151	Anatomy and Physiology	2		2
	Elective	4	—	—
50.131	Psychology of Learning II	4	—	—
63.134	Recreation Skills V	0		6
16.112	Earth Science	4	—	—

**THIRD YEAR**

QUARTER 6				
No.	Course	Cl.	L.	Q.H.
	Elective	4	—	4
63.270	Arts and Crafts	1	6	3
63.132	Interagency	3	—	3
29.163	Workshop Drama	4	—	4
63.126	Conservation and Outdoor Education	—	3	1
63.131	Tech. of Recreation Leadership	1	6	3

QUARTER 7				
No.	Course	Cl.	L.	Q.
	Elective	4	—	—
63.160	Dev. and Util. of Rec. Ed. Resources	3	—	—
63.128	Survey of Outdoor Recreation	3	—	—
	Park Facilities	1		2
63.127	Outdoor Education	4	—	—
	Elective	4	—	—

**FOURTH YEAR**

QUARTER 8				
No.	Course	Cl.	L.	Q.H.
63.210	Philosophy of Recreation and Leisure	3	—	3
63.240	Dance and the Cultures	1	6	3
63.255	Therapeutic Recreation	3	—	3
63.250	Group Dynamics	3	—	3
63.220	Methods and Materials	3	—	3
**63.143	Winter Sports (Winter Quarter)	—	—	1

QUARTER 9				
No.	Course	Cl.	L.	Q.
63.280	Supervised Field Experience			
	Conservation and Outdoor Education			
	or			
	Adapted and Hospital Recreation			
	or			
	Community Recreation			
**Also Winter, Senior Year				

**FIFTH YEAR**

QUARTER 10				
No.	Course	Cl.	L.	Q.H.
63.260	Org. & Adm. of Recreation and Parks	3	—	3
63.290	Senior Recreation Seminar	4	—	4
65.218	Public Health	3	—	3
63.146	Camp Administration			
	or			
63.257	Recreation Activities for Atypical Individuals and Groups	3	—	3
	or			
63.267	Introduction to Youth Groups	3	—	3
	Elective	4	—	4
**63.143	Winter Sports (Winter only)	1	—	1

QUARTER 11				
No.	Course	Cl.	L.	Q.
63.285	Research and Readings	4	—	—
21.111	American Society	4	—	—
63.147	Outdoor Education for Handicapped	3	—	—
63.129	School Camping	3	—	—
	or			
63.256	Workshop in Adapted Hospital Rec.	3	—	—
	or			
63.266	Community Ed. and Community Schools	3	—	—

\*\*Offered winter quarters 8 and 10

## Department of Physical Therapy

Katharine Carlisle, Chairman  
Kathryn J. Shaffer, Associate Chairman

### FACULTY

#### Professors

Katharine Carlisle, A.B.  
Kathryn J. Shaffer, B.S., M.S.

#### Visiting Professor

Whitney R. Powers, B.S., M.S., Ph.D.

#### Instructors

Janice L. Foster, B.S.  
Mary P. Watkins, B.S.

#### Associate Professor

Elizabeth W. Van Slyck, B.S., M.A.

#### Assistant Professor

Pauline A. Cerasoli, B.S., M.S.

### PHYSICAL THERAPY

Physical Therapy is one of the health professions concerned with and contributing to the present-day challenge of comprehensive medical care. This profession is concerned not only with treatment procedures which are directed toward helping the patient regain functional independence, but concerned also with his emotional and socio-economic status and needs in terms of recovery. The physical therapist is highly skilled in evaluation procedures and in the planning and execution of treatment programs appropriate to the condition or disabilities of a patient. The qualified therapist administers physical therapy only upon referral by a physician.

Physical therapy treatment procedures include the use of therapeutic exercise, heat, cold, massage, hydrotherapy, and electrotherapy for the specific purpose of restoring the disabled individual to the optimum of his capacity.

The program of study is an integration of liberal arts and sciences and professional courses, with major emphasis on liberal arts in the first half of the program and on professional preparation in the latter half of the program.

The professional courses include such subjects as anatomy, kinesiology, clinical medicine, pathology, physiology, physical therapy procedures, and practical experience in various hospitals and clinics. Professional ethics is stressed throughout the program.

Lecturers from Tufts University School of Medicine and the New England Medical Center Hospitals, as well as from many medical and social agencies in the Boston area, augment the professional staff in the physical therapy program which is approved by the American Medical Association and by the American Physical Therapy Association. Students completing the program are eligible to take state examinations for registration.

#### General Objectives

The Department of Physical Therapy is cognizant of the increasing need and demand for modern comprehensive health care and is continually concerned with the educational preparation of those who will provide physical therapy services of the highest quality.

The overall objective of the Department is to provide a program which will prepare young men and women for full and useful lives and which will, at the same time, prepare them to achieve in all aspects of the physical therapy profession.

To fulfill this objective, the student is provided with opportunities to:

1. develop breadth and depth of interest and a greater appreciation of the world in which he lives through courses in the liberal arts and sciences.
2. acquire knowledge and understanding of those liberal arts and sciences which are basic to professional courses.
3. develop a specific body of knowledge, understanding, and appreciation of physical therapy.
4. develop skills in physical therapy.
5. develop knowledge, understanding, and appreciation of the changing patterns of comprehensive health care.
6. set high standards of achievement for himself.
7. develop desirable personal and professional attitudes and relationships.
8. develop an appreciation for continuing personal and professional growth.
9. develop an appreciation of civic interest and responsibility to society in general and to the community of which he is a part.

### **Physical Therapy Clinical Education**

Clinical practice is scheduled in the senior year and consists of four different clinical assignments—two three-week blocks in the fall quarter and two six-week blocks in the spring quarter. In planning the total clinical program for each student an attempt is made to include experience in a general hospital, a rehabilitation center and some experience in working with children.

Clinical practice assignments during the spring quarter include physical therapy departments throughout the New England, New York, New Jersey and Philadelphia areas in addition to the Boston area. Students are required to carry liability insurance. Students should plan on these additional expenses.

## Specimen Program in Physical Therapy 1971-1972

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
0.104	Fund. Math	4	4	10.105	Fund. Math	4	4	12.107	Gen. Chemistry	4(3)	5
3.141	Basic An. Biol.	3(4)	4	12.106	Gen. Chemistry	4(3)	5	18.142	Basic An. Biol.	3(4)	4
0.113	English	4	4	30.114	English	4	4		Elective	4	4
5.129	Health Ed.	3	3	64.111	Intro. PH. TH.	1(1)	1		Physical Ed.	(2)	1
					Physical Ed.	(2)	1	64.112	Intro. PH. TH.	1(1)	1

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.171	Physics	4	4	11.172	Physics	4	4
19.102	Basic Psych.	4	4	18.148	Human Anatomy	3(3)	4
	Soc. Sci. Elec.	4	4		Soc. Sci. Elec.	4	4
	or				or		
	History Elec.	4	4		History Elec.	4	4
	Human Elec.	4	4		Human Elec.	4	4
	or				or		
	Mod. Lang. Elec.	4	4		Mod. Lang. Elec.	4	4

## THIRD YEAR

QUARTER 6				QUARTER 7				QUARTER 8			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
8.125	Human Physiol.	2(3)	3	64.131	Applied Anatomy	3(3)	4	18.126	Human Physiol.	2(3)	3
9.140	Child Adoles. Psych.	4	4	64.143	Phys. Ther. I	2(6)	5	64.154	Phys. Ther. II	1(4)	3
				64.210	Pathology	3	3	64.155	Phys. Ther. III	2(2)	3
4.121	Gross Anatomy	4(3)	5	64.220	Clin. Medicine I	2	2	64.221	Clin. Med. II	3	3
	Elective	4	4	65.218	Public Health	3	3	64.235	Psychiatry	3	3
								64.250	Neuroanatomy	3	3

## FOURTH YEAR

QUARTER 9				QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
4.164	Phys. Ther. IV	(4)	2	64.171	Phys. Ther. V	1(2)	2	64.195	Supervised Clinical Practice		8
4.165	Prof. Lit. & Research	1	2	64.174	Phys. Ther. VII	1(2)	2				
4.166	Rehabilitation	1	1	64.175	Ethics & Admin.	2	2				
4.172	Phys. Ther. VI	2(2)	3	64.222	Clin. Med. III	3	3				
4.185	Sup. Clin. Prac.		6	64.246	Applied Phys. Elective	2(4)	4				
						4	4				

## Health Education

### FACULTY

**Associate Professor**

Jeanne Rowlands, B.A., B.S., M.A.

**Assistant Professor**

Kerkor Kassabian, B.S., Ed.M.

**Instructor**

Ann Maguire, B.S., Ed.M.

The courses in Health Education serve each Department in Boston-Bouvé College, with electives open to students in all colleges.

# college of business administration

**James S. Hekimian, Dean**  
**Andre P. Priem, Associate Dean**  
**Harley H. Anderson, Assistant Dean**  
**John W. Jordan, Assistant Dean**

## **Programs of Study**

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. Forty to sixty percent of the coursework in these programs is in the arts and sciences to ensure a liberal education in addition to a sound preparation for a career in business or administration. Concentrations are offered in the following areas: Accounting, Finance and Insurance, Industrial Relations, Management, Marketing, and Transportation. These programs are offered on the five-year Cooperative Education Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The Graduate School of Professional Accounting is also sponsored by the College of Business Administration and awards the degree of Master of Science in Accounting. Designed specifically for Liberal Arts and other non-Accounting majors, the School was established to help satisfy the accounting profession's need for persons with a broad liberal education in a high-quality professional program. The distinctive feature of the 15-month program, a 3-month internship with a public accounting firm, is in keeping with the basic philosophy of Northeastern.

The Master of Business Administration program is primarily a professional degree program in which the major objective is to develop practitioners of business and administration. Many men and women who are enrolled are at the same time employed in various public and private organizations and are working toward their degree on a part-time basis. In addition, the Master of Business Administration program offers full-time graduate students the Management Intern Plan. Following the philosophy that a balanced exposure to theory and practice is the most effective approach to management education, the two-year program affords excellent opportunity in each area. Interwoven with the regular

academic terms are two periods of guided experience in business and other organizations. The job experience places the management intern in a situation in which he must perform as he would in any organization. The nature of the job will assure him ample opportunity to observe, research, and report upon some aspect, element, or problem of the organization.

The College also sponsors a Center for Management Development, which annually conducts intensive programs designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The program of instruction, based on modification of the Northeastern Cooperative program, permits the participants to maintain their job responsibilities during the six-month period of the course.

The Bureau of Business and Economic Research is an integral part of the College. The Bureau gives administrative assistance to research projects carried out under faculty leadership and supervision.

### **Policy**

The College of Business Administration offers programs of study to prepare men and women for positions of administrative responsibilities in business, governmental, and other organizations. Preparation for administrative positions requires an acuteness of mind in the recognition and solution of problems. In order to accomplish this, the business student is given a broad understanding of business and organizational problems as well as firsthand knowledge of effective methods of solving them. In addition, the broader scope of the business firm is studied, especially its role and responsibility in the community and the world.

To accomplish these objectives, the fundamental skills and tool subjects are dealt with in their relations to the broader context of the business firm. The upper-class programs of study assimilate the principles of modern business management and administration and integrate these with courses in liberal arts.

The courses in the curriculum fall into four categories: (1) required Liberal Arts courses, (2) Business Administration core courses, (3) Business Administration courses required in one or more concentrations, (4) Electives in either Business Administration or Liberal Arts subjects.

### **Aims**

In keeping with the current trends in collegiate education, the educational policy of the College has the following aims: first, to develop attitudes and ideals that are ethically sound and socially desirable; second, to develop an appreciation of the social, political, and economic developments to which the business firm must adjust and adapt; third, to develop those habits of accurate thinking that are essential to sound judgment; fourth, to provide an opportunity to develop a specialization in business or administration in accordance with the students' interests and talents. The Cooperative Plan is particularly helpful in this respect.

### **Accreditation**

The Undergraduate Program of the College of Business Administration is fully accredited by the American Association of Collegiate Schools of Business.



## Methods of Instruction

In the accomplishment of these aims, the College makes use of the lecture and recitation systems and the problem and case methods of instruction.

Introductory and basic tool courses are, for the most part, presented on a lecture-problem basis. A large proportion of the classwork of the upper-class years consists of discussion, analysis, and reports on specific business problems and cases.

Students are encouraged to analyze propositions, to challenge unsupported assertions, to think independently, and to support their thinking with logic and facts. Frequent verbal and written reports are required.

## Admission Requirements

Applicants to the College of Business Administration must be graduates of college preparatory programs of study. The following subjects are prescribed.

Subject	Units
English (4 years)	3
Mathematics	3
Science	1
Other college preparatory subjects	6
Electives, not more than	2
	<hr/> 15

(A limited number of qualified students are accepted each year into the upper-class years by transfer from other colleges and universities.)

## Graduation Requirements

Students may qualify for the degree of Bachelor of Science in Business Administration in one of the following areas of concentration: accounting, finance and insurance, industrial relations, management, marketing, and transportation. With the advice of faculty, students may develop a concentration of study suitable to their particular career interests.

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. This usually totals 179 quarter hours of credit. Students undertaking the cooperative education program must also meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

The final three quarters immediately preceding graduation must be completed in residence at Northeastern.

## Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated area of concentration. An overall average grade of C is required for graduation.

### **Graduation with Honor**

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they become eligible for honors at graduation.

### **The Programs of Study**

#### *First Year*

The 36 weeks of the freshman year are primarily devoted to a survey of the political and social institutions that underlie the conduct of a business. In addition, accounting, English, and mathematics are given important positions in the program of this first year because of their fundamental significance as tools of communication for the businessman. The study of business is introduced by examining the relationship of business organizations to the environment in which they operate.

Other courses can be elected to enrich the student's background in such fields as the physical sciences and the cultural foundations of our civilization.

In addition to regularly scheduled orientation meetings with the Dean of Freshmen, throughout the freshman year each student has the friendly counsel and guidance of a faculty adviser whose aim is to help bridge the gap between high school and college. Faculty in the College are available to assist the student in formulating his career plans.

#### *Upper-Class Years*

Under the Northeastern five-year Cooperative Plan, the alternation of work and classroom study starts with the second year. During this year, all students continue with a common program, a major portion of which is devoted to courses which introduce the functional areas of business operation and provide analytical skills which underlie managerial decision-making.

At the end of the second year, at the close of Quarter 5, students formally elect their areas of concentration in accordance with their individual interests and aptitudes. To help make this choice, a student may obtain professional advice in Northeastern's Counseling and Testing Center.

During the remaining three years, specific required courses are taken in a common core, and elective coursework is taken in both business and non-business areas. Business electives may be taken in a sequence which allows the student to develop one or more concentrations.

A brief statement of the nature of the vocational opportunities in the various concentrations and specimen programs follows.

## Specimen Program Without a Concentration

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
9.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
0.124	Math I	4	10.125	Math II	4	30.114	English II	4
	L.A. Elective	4	19.105	Psych I	4	19.106	Psych II	4
0.113	English I	4		L.A. Elective	4		L.A. Elective	4

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.250	Quan. Meth. I	4	49.251	Quan. Meth. II	4
49.101	Intro. Comp. Me.	2	39.106	Econ. Prin.	4
39.105	Econ. Prin.	4	44.120	Intro. Fin. Act.	4
43.120	Intro. to Mktg.	4		L.A. Elective	4
45.120	Mgr. and Org.*	4			

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
45.209	Org. Beh I	4	45.210	Org. Beh II	4
	L.A. Elective	4		L.A. Elective	4
	B.A. Elect.	4		B.A. Elective	4
	Open Elect.	4		Open Elect.	4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
	L.A. Elective	4	45.250	Bus. and Society	4
	B.A. Electives	8		L.A. Elective	4
	Open Elective	4		B.A. Elective	4
				Open Elective	4

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
45.112	Busin. Policy	4		B.A. Elective	4
	L.A. Elective	4		Open Electives	12
	B.A. Elective	4			
	Open Elective	4			
90.251	Place Tech.	1			

\*Applies to 1971-72 only. Thereafter, students will take an additional Liberal Arts elective.

## Accounting Department

Joseph M. Golemme, Professor and Chairman, S.B., M.A., C.P.A.

### Professors

Lawrence H. Malchman, B.S., Ed.M.,  
C.P.A.  
Albert Slavin, B.S., M.S., C.P.A.

### Assistant Professors

Claremont Carter, B.S., M.B.A.  
Robert Farrar, B.S., M.B.A.  
Peter A. Lans, B.S., M.B.A.  
Paul Richards, B.S., M.B.A.

### Associate Professors

Anker V. Andersen, B.S., M.B.A., Ph.D.  
Joseph R. Curran, B.S., M.B.A., Ph.D.  
William H. Gruber, B.S., M.B.A., Ph.D.  
Richard Lindhe, B.S., B.A., B.S.Ed.,  
M.Ed., Ph.D.

### Instructors

Steven D. Grossman, B.S., M.A.  
John O'Connell, B.S., M.B.A., Ph.D.

### Accounting

Accounting is the second largest field of professional employment. Accountants may specialize in such areas as auditing, tax work, cost accounting, budgeting and control, systems and procedures, agents, investigations, bank examiners, and management services.

Leaders of institutions—business, commerce, and industry; state, local, and national governments; bureaus and agencies; schools, churches, hospitals, and foundations—all rely on data accumulated and prepared by accountants when making decisions which vitally affect the destinies of their institutions. New techniques such as electronic data processing machines are being used for the more effective collection and use of accounting data.

Students who intend to become Certified Public Accountants (C.P.A.) may take 13 courses (52 credit hours) in this area beyond the core introductory courses in accounting.

## Specimen Program with a Concentration in Accounting

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
49.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
10.124	Math I	4	10.125	Math. II	4	30.114	English II	4
19.105	Psych. I	4	30.113	English I	4	19.106	Psych. II	4
	L.A. Elective	4		L.A. Elective	4		L.A. Elective	4

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.101	Intro. Computer	2	39.106	Econ. Prin.	4
39.105	Econ. Prin.	4	44.120	Intro. to Fin. Act.	4
43.120	Intro. to Mktg.	4	49.251	Quan. Meth. II	4
	L.A. Elective	4		L.A. Elective	4
49.250	Quan. Meth. I	4			

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
45.209	Org. Beh.	4	45.210	Org. Beh.	4
41.251	Intrmed. Acct.	4	41.252	Intrmed. Acct.	4
41.253	Cost Acct.	4	41.254	Cost Acct.	4
	L.A. Elective	4		L.A. Elective	4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
	L.A. Elective	4	45.250	Bus. and Society	4
	B.A. Elective	4	41.263	Acct. Plan'g. & Control	4
	Open Elective	4		L.A. Elective	4
41.262	Acct. Theory & Prac.	4		Open Elective	4

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
45.112	Business Policy	4		Open Electives	16
90.251	Place. Tech.	1			
	Open Electives	8			
	L.A. Elective	4			

## Finance and Insurance Department

Wesley W. Marple, Jr., Professor and Chairman, A.B., M.B.A., D.B.A.

### Professors

Anghel N. Rugina, B.S., M.A., Ph.D.  
Edward R. Willett, B.S., M.A., Ph.D.

### Assistant Professors

Harold D. Fletcher, B.S., M.A.  
Fred R. Kaen, B.S., M.B.A.

### Associate Professors

Robert H. Caplan III, B. Ch.E.,  
M.B.A., D.B.A.  
Saverio Cerullo, B.S., M.B.A.  
Roger A. Cossaboom, B.S., M.B.A.,  
D.B.A.  
Robert L. Hehre, B.S., M.B.A., M.S.,  
D.B.A., C.P.A.

### Finance and Insurance

The Department of Finance and Insurance offers a variety of courses and options to those who want to concentrate their courses in this area as well as to those who want to extend their competence and knowledge in a minor field. Advisers are available in the Departmental Office to counsel students about course and career choices. Students interested in careers in the areas of security analysis, estate planning, corporate finance and control, security or insurance brokerage, underwriting, credit management, banking, and other fields requiring the management of funds, select the Finance and Insurance concentration. In addition to preparing themselves for careers, some students select this area solely for its intellectual stimulation and excitement.

Concentrators in this area normally take four courses (44.150, 44.151, 44.260, and 44.275) in their middler year. At least two other courses are usually taken in the junior or senior years in one of the following sub-fields of finance: Managerial Finance 44.242, 44.243, 44.222, 44.281, 44.159, 44.160, 44.161; Financial Analysis 44.270, 44.272, 44.161, 44.281; Management of Financial Institutions 44.144, 44.161, 44.281, and Insurance 44.162, 44.250, 44.252, 44.255, 44.281.

All courses offered by the Department are open to students who have taken prerequisite courses without regard to their areas of concentration. In special circumstances instructors may waive prerequisite courses. Because of staffing constraints, not all courses are offered every year.

## Specimen Program with a Concentration in Finance and Insurance

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
9.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
0.124	Math I	4	10.125	Math II	4	30.114	English II	4
	L.A. Elective	4	19.105	Psych. I	4	19.106	Psych. II	4
0.113	English I	4		L.A. Elective	4		L.A. Elective	4

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.101	Intro. Computer	2	39.106	Econ. Prin.	4
39.105	Econ. Prin.	4	44.120	Intro. Fin. Act.	4
43.120	Intro. to Mktg.	4	49.251	Quan. Meth. II	4
	L.A. Elective	4		L.A. Elective	4
49.250	Quan. Meth. I	4			

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
45.209	Org. Beh. I	4	45.210	Org. Beh. II	4
	L.A. Elective	4		L.A. Elective	4
44.150	Corp. Fin.	4	44.275	Mon. & Ec. Activity	4
44.151	Intpr. Fin. Data	4	44.260	Financial Planning	4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
	Fin. Elective	4		L.A. Elective	4
	L.A. Elective	4		Open Elective	4
	B.A. Elective	4		Fin. Elective	4
	Open Elective	4	45.250	Bus. & Society	4

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Open Elective	4		Open Electives	12
	L.A. Elective	4	44.281	Seminar*	4
44.260	Financial Planning	4			
45.112	Business Policy	4			
90.251	Place. Tech.	1			

\*For 1971 only. Thereafter, students take additional open electives.

## Industrial Relations

This concentration is taught by the faculty of the Management Department.

### Industrial Relations

Opportunities exist in the field of labor-management relations in business and non-business organizations. Both unions and management offer positions in personnel administration, collective bargaining, and wage and salary administration. As collective bargaining has developed in the public sector, opportunities have become available for specialists in Industrial Relations in local, state, and Federal government organizations.

### Specimen Program with a Concentration in Industrial Relations

#### FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
49.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
10.124	Math I	4	10.125	Math II	4	30.114	English II	4
	L.A. Elective	4	19.105	Psych. II	4	19.106	Psych. II	4
30.113	English I	4		L.A. Elective	4		L.A. Elective	4

#### SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.101	Intro. Computer	2	49.251	Quan. Meth. II	4
39.105	Econ. Prin.	4	39.106	Econ. Prin.	4
43.120	Intro. to Mktg.	4	44.120	Intro. Fin. Act.	4
	L.A. Elective	4		L.A. Elective	4
49.250	Quan. Meth. I	4			

#### THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
	B.A. Elective	4		B.A. Elective	4
	L.A. Elective	4		L.A. Elective	4
45.209	Org. Beh. I	4	45.210	Org. Beh. II	4
	Open Elective	4		Open Elective	4

#### FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
	L.A. Elective	4		L.A. Elective	4
	B.A. Elective	4	39.275	Labor Econ.	4
	Open Elective	4		B.A. Elective	4
45.260	Pers. and Ind. Rel.	4	45.250	Bus. and Society	4

#### FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
45.112	Business Policy	4	45.276	Col. Bargain	4
	L.A. Elective	4		Open Electives	12
45.275	Labor Law	4			
	Open Elective	4			
90.251	Place. Tech.	1			



## Management Department

### Professors

Dean S. Ammer, B.S., M.B.A., Ph.D.  
 Joseph C. Bailey, A.B., A.M., Ph.D.  
 Carlo E. Gubellini, B.S., M.B.A.  
 Lyman A. Keith, B.S., M.A., M.B.A.  
 A. Howard Myers, A.B., M.A., Ph.D.  
 Arthur H. Walker, B.A., M.B.A., D.B.A.

### Associate Professors (Cont.)

Edward S. Marshall, M.A., Ph.D.  
 Herman Rochwarg, B.A., Ph.D.  
 Daniel Scioletti, B.B.A., M.Ed., LL.B.  
 Barry Shore, A.S., M.B.A., Ph.D.

### Associate Professors

Robert Abbanat, B.S., M.B.A., D.B.A.  
 Warren Briggs, B.S., M.B.A., Ph.D.  
 Paul Croke, A.B., M.B.A., Ph.D.  
 Angelo Fiumara, B.A., LL.B.  
 Richard B. Higgins, B.A., Ph.D.  
 Christine L. Hobart, A.B., D.B.A.

### Assistant Professors

Jules I. Borack, B.S., M.S.  
 Robert Guthrie, B.S., M.S.  
 Robert Lieb, B.S., M.B.A., D.B.A.  
 Robert Otlewski, B.S., M.B.A., M.A.  
 Robert A. Parsons, B.S., M.B.A., M.A.  
 Jeffrey A. Timmons, B.A., M.B.A.  
 D.B.A.

### Management

This area of concentration appeals to the student who is more interested in preparation for general business administration and operations management. Positions are available to graduates of this program in commercial, manufacturing, and service businesses. Production planning and control, industrial purchasing and sales, cost control, methods analysis, time study, industrial safety, personnel management, self-employment, and many other vocational opportunities are available.

## Specimen Program with a Concentration in Management

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
49.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
10.124	Math I	4	10.125	Math II	4	30.114	English II	4
	L.A. Elective	4	19.105	Psych. I	4	19.106	Psych. II	4
30.113	English I	4		L.A. Elective	4		L.A. Elective	4

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.101	Intro. Computer	2	39.106	Econ. Prin.	4
39.105	Econ. Prin.	4	44.120	Intro. Fin. Act.	4
43.120	Intro. to Mktg.	4	49.251	Quan. Meth. II	4
	L.A. Elective	4		L.A. Elective	4
49.250	Quan. Meth. I	4			

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
	L.A. Elective	4		L.A. Elective	4
45.209	Org. Beh. I	4	45.210	Org. Beh. II	4
41.205	Cost Acct.	4	49.206	Info. Systems	4
	Open Elective	4		Open Elective	4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
	L.A. Elective	4	45.112	Business Policy	4
45.260	Pers. and Ind. Rel.	4		L.A. Elective	4
49.155	Legal Aspects	4	45.265	Prod. Mgt.	4
	B.A. Elective	4		Open Elective	4

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
45.250	Bus. & Society	4		Open Electives	16
	B.A. Elective	4			
	L.A. Elective	4			
	Open Elective	4			
90.251	Place. Tech.	1			

## Marketing Department

Charles H. Dufton, Professor and Chairman, A.B., M.A.

### Professors

Charles J. Collazzo, Jr., B.A., M.C.S.,  
M.A., Ph.D.

Robert H. Minichiello, A.B., M.B.A.,  
D.B.A.

### Assistant Professors

Richard J. Morrison, B.A., M.B.A.

Frederick Wiseman, B.S., M.S., Ph.D.

### Associate Professors

Philip R. McDonald, B.A., M.B.A.,  
D.B.A.

Dharmendra Verma, B.Sc., M.B.A.,  
Ph.D.

### Marketing

As a member of the management policy group, the marketing executive takes a broad view of all aspects of business management and policy. He can also serve effectively as a trained specialist in his own area of increasing opportunity and responsibility.

With success in the market vital to every company, the need for adaptable and informed marketing management—and therefore, opportunities of careers in marketing—exist in every type of business and industry, large or small; in manufacturing and wholesaling as well as retailing; in service, research, and administrative organizations; in both consumer and industrial products; in advertising departments, agencies, and media; in sales, product design, research, marketing management, marketing administration, merchandising, and promotion.

### *The Marketing Concentration—Required Marketing Courses*

The College of Business Administration student who elects to concentrate in Marketing will be required to take six courses as follows:

1. *Marketing Management I and II*—in the middler year.
2. *Marketing Research*—in the junior year.
3. *Competitive Strategy*—a capstone marketing course in the senior year.
4. Two (2) Marketing Electives—Students concentrating in Marketing will be free to select any marketing electives except those specifically restricted to nonmarketing concentrations. A series of “concentrations” or “sequences” including marketing electives, other business electives, and liberal arts electives will be available to these students to help them decide on a logical selection and sequencing of upper-level courses.

### *Electives Available in the Marketing Area*

Students from other functional areas both in and outside the College of Business Administration may elect a specialization in Marketing. A variety of optional specializations are available, in any combination of marketing electives including a) Marketing Management I, b) one of: Marketing Management II,

Retail Management, Marketing Channels, Industrial Marketing, Advertising Management, plus c) other open electives offered by the Department. (For non-marketing concentrations, Competitive Strategy is not required.) In addition, a number of courses offered by the Department are open on an individual elective basis.

Specimen Program with a Concentration in Marketing

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
49.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
	Math. I	4	10.125	Math. II	4	30.114	English II	4
	L.A. Elective	4	19.105	Psych. I	4	19.106	Psych. II	4
30.113	English I	4		L.A. Elective	4		L.A. Elective	4

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.101	Intro. Computer	2	49.251	Quan. Meth. II	4
39.105	Econ. Prin.	4	39.106	Econ. Prin.	4
43.120	Intro. to Mktg.	4	44.120	Intro. to Fin. Act.	4
	L.A. Elective	4		L.A. Elective	4
49.250	Quan. Meth. I	4			

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
45.209	Org. Beh. I	4	45.210	Org. Beh. II	4
	L.A. Elective	4		L.A. Elective	4
43.250	Mktg. Mgt. I	4	43.251	Mktg. Mgt. II	4
	Open Elective	4		Open Elective	4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
	B.A. Elective	4	45.112	Business Policy	4
	L.A. Elective	4		L.A. Elective	4
	Open Elective	4		Mktg. Elective	4
43.240	Mktg. Res.	4		Open Elective	4

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
	Mktg. Elective	4		Open Electives	12
	L.A. Elective	4	43.278	Comp. Strategy	4
	Open Elective	4			
45.250	Bus. and Society	4			
90.251	Place. Tech.	1			

## Transportation

This concentration is taught by the faculty of the Management Department.

### Transportation

The need for qualified people in the field of transportation and business logistics has increased rapidly in recent years. In the industrial setting, continued emphasis on cost control and the pressures of widespread distribution have created a demand for people who understand the dynamics of logistical function which involves inventory control, warehousing, transportation and the interaction of these activities with other functional operations. Growing concern with the economic and service conditions of the transportation industry has also created many governmental positions with Federal, state and local agencies which are engaged in policy development and administration. Carriers such as airlines, railroads and trucking companies similarly are interested in hiring people who are familiar with the operational and regulatory-oriented aspects of their business. Employment opportunities may also be found in consulting and teaching.

Course offerings in transportation and business logistics are sequenced so that students who desire only an introductory exposure to the field may take one or several courses as part of a broader business background. However, a sufficient number of courses will be offered to enable students to choose a concentration in transportation and business logistics in preparation for a career in this field. By electing a specific combination of courses, the student may tailor his program to meet the requirements of a number of the aforementioned occupations.

## Specimen Program with a Concentration in Transportation

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Q.H.	No.	Course	Q.H.	No.	Course	Q.H.
49.100	Intro. to Business	4	41.111	Accounting	4	41.112	Accounting	4
10.124	Math. I	4	10.125	Math. II	4	30.114	English II	4
30.113	L.A. Elective	4	19.105	Psych. I	4		L.A. Elective	4
	English I	4		L.A. Elective	4	19.106	Psych. II	4

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Q.H.	No.	Course	Q.H.
49.250	Quan. Meth. I	4	39.106	Econ. Prin.	4
49.101	Intro. Comp. Me.	2	44.120	Intro. Fin. Ac.	4
39.105	Econ. Prin.	4	49.251	Quan. Meth. II	4
43.120	Intro. to Mktg.	4		L.A. Elective	4
	L.A. Elective	4			

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Q.H.	No.	Course	Q.H.
45.209	Org. Beh. I	4	45.210	Org. Beh. II	4
48.101	Intro. to Trans.	4	48.104	Bus. Logistics	4
	L.A. Elect.	4		L.A. Elective	4
	Open Elect.	4		Open Elect.	4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Q.H.	No.	Course	Q.H.
48.102	Cur. Issues in Trns.		45.250	Bus. and Society	4
	Pol.	4		Transp. Elective	4
	B.A. Elective	4		L.A. Elective	4
	L.A. Elective	4		Open Elective	4
	Open Elective	4			

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Q.H.	No.	Course	Q.H.
45.113	Business Policy	4		Transp. Elective	4
	Transp. Elective	4		Open Elective	12
	L.A. Elective	4			
	Open Elective	4			
90.251	Place. Tech.	1			

# college of criminal justice

**Norman Rosenblatt, Dean**

## **Professor**

Robert Sheehan, A.B., M.A.

## **Associate Professor**

Frederick Cunliffe, B.S., M.S., Ph.D.

## **Assistant Professors**

Lois Ames, A.B., M.S.W.

Haskell Kassler, A.B., D. Jur.

Richard Natoli, B.S., M.Crim.

Joseph Senna, A.B., M.S.W.

## **General Objective**

The College of Criminal Justice, established in 1966 under a grant from the Ford Foundation, prepares young men and women for professional careers in Criminal Justice. The curriculum has been designed primarily for students interested in careers in the ever-expanding areas of social and community services. Law enforcement, corrections, rehabilitation and social welfare are some of the careers students pursue. It is expected that a number of graduates will choose advanced study in academic fields including criminology, social work, public administration and law.

It is evident that this new College is urgently needed to meet a growing social problem of our times. Innovative methods and ideas, as well as basic information, are needed by those involved in community and social service to cope with the growing problems of our society. Those engaged in this important service to society now need much more formal education than in the past.

Northeastern's College of Criminal Justice will make a substantial contribution to the education of professional personnel in criminal justice in the years ahead.

## **Methods and Purpose**

The College of Criminal Justice offers a five-year academic program on the Cooperative Plan of Education which allows a candidate for the baccalaureate degree to undertake a highly specialized program of study. It is anticipated that "co-op" assignments will include work in police departments, juvenile and adult correctional institutions, and probation, parole and social agencies.

The student will receive a broad educational background for his future specialized role in criminal justice. Course work in the social sciences, behavioral sciences and the humanities will be integrated with studies in juridical theory and practice, since the student will be preparing himself for a career involving the social problems of people from all walks of life. The liberal content of the

curriculum is not only highly desirable for its value as a foundation upon which his general intellectual development may be based, but also as an indispensable educational requirement for professional service in his field of special interest.

The graduate must be prepared to judge objectively the many socio-economic problems inherent in the administration of justice in contemporary American society. Obsolete and intellectually antiquated methods of administering justice have no place in a highly developed urban-industrial civilization. The College of Criminal Justice of Northeastern University will help prepare the student for a career which will not only be personally productive and rewarding but intellectually stimulating as well. He will become a pioneer in one of America's most important newly emerging professions.

### Admission Requirements

All applicants are expected to have completed the following subject-matter units:

Subject	Units
English (4 years)	3
Mathematics (minimum)	1
Science (minimum)	1
Other college preparatory subjects	6
Electives, not more than	4
<b>TOTAL</b>	<b>15</b>

### Graduation Requirements

#### *Quantitative Requirements*

Candidates for the Bachelor of Arts degree must complete all of the prescribed work of the curriculum. This curriculum totals 173 quarter hours credit.

Students who undertake the Cooperative Education Program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

#### *Qualitative Requirements*

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an overall average of C to be eligible for graduation. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

#### *Graduation with Honor*

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for at least three years before they become eligible for honors at graduation.



## Specimen Program in Criminal Justice

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.100	Prin. of Soc.	4	4	19.105	Found. of Psych.	4	4	19.106	Psych.	4	4
0.113	English	4	4	22.101	Intra. to Pol. Sci.	4	4	22.102	Intra. to Pol. Sci.	4	4
9.115	Econ.	4	4	30.114	English	4	4	39.116	Economics	4	4
2.201	Hist. of C.J.	3	3	92.202	Hist. of C.J.	3	3	92.203	Hist. of C.J.	3	3

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
18.114	Anatomy	4	4	18.115	Physiology	4	4
	Elective	4	4	22.141	Govt. Pol. States	4	4
92.106	Law Enforce.	4	4	92.164	Corrections	4	4
92.112	Crim. Behav.	4	4		C.J. Elective	4	4

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
92.141	Crim. Law	4	4	21.131	Criminology	4	4
	C.J. Elective	4	4	92.134	Civil Liberties	4	4
	Electives		8		C.J. Elective	4	4
					Elective	4	4

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	C.J. Electives	8	8		C.J. Electives	8	8
	Electives		8		Electives		8

## FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	C.J. Electives	8			C.J. Electives	8	
	Electives		8		Electives		8

# college of education

**Frank E. Marsh, Jr., Dean**

**Thomas J. Cavanagh, Assistant Dean**

**Charles F. Haley, Assistant Dean and Director of  
Student Teaching**

## **Aims**

The College of Education is increasingly and continuously concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described and the several ways of assessing it are outlined.

All students will be expected to take the five-year cooperative program because the staff of the College of Education believes in a regularly patterned program of work experience. Such opportunities are provided in social agencies, libraries, hospitals, and in schools.

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work: Social Science, United States History, American Literature, Public Speaking, Human Development, and English. Second, all students must complete a minimum of 16 credits in each of the following areas: Science and Mathematics, Humanities, and Social Sciences.

Those preparing to teach at the secondary level must choose an academic major from among the following fields: Social Studies, English, Foreign Languages, Earth Science, General Science, Biology, Chemistry, Physics, Mathematics. Those preparing to teach at the elementary level must select an area major from among the following: Social Sciences, Humanities, Science and Mathematics, or Language-Reading. It is recommended that students have a field of concentration in mind before admission to the University since in most cases the choice will make a difference in their program for the freshman year.

An advisory system and a continuous process of evaluation by the Academic Standing Committee of the College of Education are designed to ensure that students enrolled in the teacher education program have the ability to master college work, that they have chosen the correct major field, and that they have a sincere commitment to teaching as a career goal. Evaluations are made on academic aptitude, verbal fluency, interest in working with young people, and emotional maturity. These factors are assessed in their interrelationships rather than as isolated phenomena.

## Admission Requirements

Important to the future teacher is high ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

All applicants are expected to have completed the following subject-matter units:

Subject	Units
English (4 years)	3
Mathematics (minimum)	1
Science (minimum)	1
Other college preparatory subjects	6
Electives, not more than	4
	<hr/> 15

Students who wish to major in the Teaching of Science and Mathematics must be able to present these units:

*Algebra, through quadratics; Plane Geometry and Trigonometry	3½ units
Physics and Chemistry	2 units

\*The full sequence of college preparatory Mathematics courses is strongly recommended.

It is desirable for students who wish to major in the Teaching of General Science to be able to present one unit in biology.

## Graduation Requirements

### Degrees

The College of Education will award the degree of Bachelor of Science in Education to those who successfully complete the program of preparation for teaching at elementary or secondary school level.

### Quantitative Requirements

The required courses in each of the undergraduate curricula in the College of Education are indicated on the following pages. Each curriculum requires not less than 173 quarter hours of classwork, including one quarter of student teaching. At least 32 quarter hours will be required in Education, including student teaching. At least 16 quarter hours will be required in each of the following areas: Science and Mathematics; Humanities; Social Sciences.

The final three quarters immediately preceding graduation must be completed in residence at Northeastern.

### Elective Courses

Elective courses, approved by the Dean of the College of Education, will be selected by the student from among courses in the Colleges of Liberal Arts and Business Administration.

### *Qualitative Requirements*

Students in the College of Education will be expected to maintain an overall average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

### *Graduation with Honor*

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

### **Cooperative Plan**

Upon successfully completing thirty-six weeks of academic work, students in the College of Education are placed on the Cooperative Plan. In this program periods of classroom work alternate with a variety of work experiences in industry, social service agencies, community organizations, etc. This program, which has proved to be of inestimable value in offering students both the theoretical and practical aspects of a broad education, is consistent with the philosophy of the College of Education.

Opportunities are increasing steadily for selected students to participate as employees of cooperating school departments. Assisting in administrative as well as instructional functions, the student enjoys unique opportunity to acquire broad viewpoints and rich experience which will greatly enhance his confidence and effectiveness as a teacher. Students must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

### **National Teacher Examinations**

All students who plan to make teaching their career will be expected to write the general and special National Teacher Examinations in their senior year.

### **Programs of Instruction**

Students in the College of Education will find a variety of fields of specialization available. For secondary teaching, there are Biology, Chemistry, Physics, Earth Sciences, General Science, Mathematics, Social Studies, English, and Modern Languages. An undergraduate major is also offered in Speech and Hearing Therapy. Those interested in elementary teaching must complete a broader type of major, in Social Science, Humanities, Science and Mathematics or Reading-Language. Those wishing Science and Mathematics will follow a program adapted from the General Science program. Specimen programs are shown on the pages that follow.

### **Accreditation**

The programs offered by the College of Education are accredited by the National Council for Accreditation of Teacher Education. The College is a member of the American Association of Colleges for Teacher Education.

**ADMINISTRATION DEPARTMENT***(Education)*

Charles F. Ritch, Jr., Professor and Chairman, A.B., A.M., Ed.D.

**Associate Professors**

Robert S. Butters, B.A., M.Ed., Ed.D.

Philip J. Rusche, A.B., B.S., M.A., Ed.D.

**Assistant Professor**

Carleton B. Lehmkuhl, B.S., M.S., Ph.D.

This Department offers graduate courses only. Consult Graduate Bulletin for course offerings.

**COUNSELOR EDUCATION***(Education)*

David R. Cook, Professor and Chairman, B.S., M.S., Ed.D.

**Associate Professors**

Thomas F. Harrington, B.A.

M.Ed., Ph.D.

Robert W. Read, A.B., M.A., Ed.D.

**Assistant Professors**

Irvin Doress, A.B., M.A., Ed.D.

William G. Quill, B.S.Ed., M.E., Ed.D.

This Department offers graduate courses only. Consult Graduate Bulletin for course offerings.

**FOUNDATIONS DEPARTMENT***(Education)*

John D. Herzog, Associate Professor and Chairman, A.B., M.A.T., Ph.D.

**Professor**

E. Lawrence Durham, A.B., M.A.

**Assistant Professors**

Ronald E. Baptiste, A.B., M.Ed.

Gloria D. Bernheim, B.A., M.A., Ph.D.

**Associate Professors**

Wendell R. Brown, B.A., LL.B.,

D.S.S.

E. Vaughn Gulo, A.B., M.A., Ed.D.

Mervin D. Lynch, B.S., M.S., Ph.D.

Joseph Meier, Ed.M., Ed.D.

Irene A. Nichols, B.S., M.Ed., Ed.D.

Alvin D. Zalinger, B.S.Ed., M.A.

**Instructor**

Cheryl C. Hanks, A.B., A.M.

## INSTRUCTION DEPARTMENT

*(Education)*

Gregory C. Coffin, Professor and Chairman, A.B., Ed.M., Ph.D.

### Associate Professors

Russell J. Call, B.Ed., M.A., Ed.D.  
 Mary J. Lee, B.A., Ed.M.  
 Robert C. McLean, Jr., A.B., M.S.,  
 Ed.D.  
 Harold A. Miner, B.S., Ed.M.,  
 Ed.D.  
 Paul H. Tedesco, A.B., A.M., Ph.D.

### Assistant Professors

Thomas H. Clark, A.B., M.A.  
 F. Andre Favat, A.B., Ed.M.  
 Joyce M. Grant, B.S. in Ed.  
 Sandra M. Parker, B.A., Ed.M.  
 Guy A. Petralia, A.B., A.M., Ed.M.

## READING DEPARTMENT

*(Education)*

Melvin E. Howards, Professor and Chairman, B.S., M.A., Ph.D.

### Associate Professor

Maurice Kaufman, B.S., M.S.,  
 Ph.D.

### Assistant Professors

Nicholas J. Buffone, B.A., M.A., Ph.D.  
 Leslie A. Burg, B.S., M.Ed.  
 John F. Maguire, A.B., Ed.M.

### Instructor

William D. Thomas, B.A., Ph.B.,  
 M.Ed.

## REHABILITATION AND SPECIAL EDUCATION DEPARTMENT

*(Education)*

Reuben J. Margolin, Professor and Chairman, A.B., M.A., Ed.D.

### Professors

Robert J. Ferullo, B.S., Ed.M.,  
 Ed.D.  
 George J. Goldin, B.S., M.S., Ph.D.

### Assistant Professors

Richard C. Berry, B.A., M.A., Ph.D.  
 Nancy W. Brown, B.B.A., M.A., Ed.D.  
 Frances J. Johnston, B.A., M.A.  
 Susanna D. Troutman, B.A., M.A.

### Associate Professors

Grace Kaczynski, B.A., Ed.M., Ed.D.  
 Matthew H. Luzzi, B.A., M.Ed.,  
 C.A.G.S., Ed.D.  
 Jack L. Weber, B.A., M.A., Ph.D.

### Instructors

Raymond J. Archibald, B.A., M.Ed.  
 Linda L. Lohrbauer, A.B., M.A.  
 Leslie S. Walsh, B.S. in Ed., M.Ed.

## Specimen Program in Teaching of Biology

This program prepares biology teachers for the junior or senior high school. It provides a basis for specialized graduate study in biology as well as in education.

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
0.101	Basic Math.	3	3	10.102	Basic Math.	3	3	10.103	Basic Math.	3	3
2.106	Gen. Chem.	4(3)	5	18.132	Ani. Bio.	3(4)	4	12.107	Gen. Chem.	4(3)	5
3.131	Gen. Bio.	3(4)	4	30.113	English	4	4	30.114	English	4	4
0.111	Soc. Science	3	3	50.112	Soc. Science	3	3	50.113	Soc. Science	3	3

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.144	Organic Chem.	4(3)	5	12.145	Organic Chem.	4(3)	5
18.133	Plant Bio.	3(4)	4	18.134	Environ. Bio.	3(4)	4
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
50.121	Human. Dev. I	4	4	50.131	Hum. Dev. & Lrng. II	4	4

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.171	Basic Physics	4	4	11.172	Basic Physics	4	4
18.135	Genet. & Devel.	3(4)	4	18.136	Cell Bio.	3(4)	4
	Biology Elective	4	4		Biology Elective	4	4
51.135	Anal. Tchg. & Seminar	4	4	50.141	Meas. & Eval.	4	4

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
51.147	M. & M. Science	4	4		Biology Elective	4	4
	Biology Elective	4	4	26.133	Philos. of Sci.	4	4
	Human. Elective	4	4		Human. Elective	4	4
	Elective	4	4	29.100	Public Spkg.	3	3

## FIFTH YEAR

QUARTER 10				QUARTER 10A				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
0.180	Amer. Lit. I	4	4	51.151	Student Teaching & Seminar	8		30.181	Amer. Lit. II	4	4
0.151	Bkgrnds.								Biol. Elec.	4	4
	Amer. Ed.	4	4								
	Biology Electives	8	8								
0.253	Prof. Dev.	1	1								

Course descriptions are listed at the back of the catalog in numerical order.

## Specimen Program in Teaching of Chemistry

This program prepares chemistry teachers for the senior high school. It provides a basis for specialized graduate study in chemistry as well as in education.

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.150	Calculus	4 4	10.151	Calculus	4 4	10.152	Linear Alg.	4 4
12.103	Gen. Chem.	4(3) 5	12.104	Gen. Chem.	4(3) 5	12.105	Anal. Chem.	4(6) 5
18.131	Gen. Bio.	3(4) 4	18.132	Ani. Bio.	3(4) 4	30.114	English	3 3
30.113	English	4 4	50.112	Soc. Science	3 3	50.113	Soc. Science	3 3

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Elective	4 4		Elective	4 4
11.122	Physics	4(4) 5	11.123	Physics	4(4) 5
11.124	Physics Lab.	(3) 1	12.154	Organic Chem.	3(3) 4
12.153	Organic Chem.	3(3) 4	50.131	Hum. Dev. & Lrng. II	4 4
50.121	Human Dev. & Lrng. I	4 4			

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.155	Organic Chem.	3(6) 5	12.167	Physical Chem.	3(6) 5
12.166	Physical Chem.	3 3	12.185	Inorg. Chem.	2 2
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4	50.141	Meas. & Eval.	4 4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.168	Physical Chem.	3(3) 4	12.212	Adv. Inorg. Chem.	2 2
12.179	Analytical Chem.	3(6) 5	12.253	Id. Org. Chem.	1(6) 3
12.211	Adv. Inorg. Chem.	2 2	29.100	Public Spkg.	3 3
51.147	M. & M. Science	4 4		Human. Elective	4 4
	Human. Elective	4 4		Elective	4 4

## FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4	51.151	Student Teaching & Seminar	8		Chem. Elective	4 4
	Chem. Elective	4 4					Elective	4 4
	Electives	8 8						
90.253	Prof. Dev.	1 1						

Course descriptions are listed at the back of the catalog in numerical order.



## Specimen Program in Teaching of Earth Sciences

Each year an increasing number of secondary schools are introducing the relatively new curriculum in earth science. The program is characterized by a solid foundation in the basic sciences with depth in the geology area and breadth in the other areas of the earth sciences.

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
0.101	Basic Math.	3	3	10.102	Basic. Math.	3	3	10.103	Basic Math.	3	3
2.106	Gen. Chem.	4(3)	5	18.132	Ani. Bio.	3(4)	4	12.107	Gen. Chem.	4(3)	5
8.131	Gen. Bio.	3(4)	4	30.113	English	4	4	30.114	English	4	4
0.111	Soc. Science	3	3	50.112	Soc. Science	3	3	50.113	Soc. Science	3	3

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.171	Basic Physics	4	4	11.172	Basic Physics	4	4
16.141	Phys. Geology	4	4	16.142	Hist. Geology	4	4
50.121	Human Dev. & Lrng I	4	4	29.100	Pub. Speaking	3	3
	Elective	4	4	50.131	Human Dev. & Lrng. II	4	4

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.---	Sci. Elective	4	4	16.---	Sci. Elective	4	4
23.210	U.S. to 1865	4	4	23.211	U.S. from 1865	4	4
	or				or		
30.180	Amer. Lit.	4	4	30.181	Amer. Lit.	4	4
	Elective	4	4		Elective	4	4
51.135	Anal. Tchg. & Ed. Proc.	4	4	50.141	Meas. & Eval.	4	4

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.---	Sci. Elective	4	4	16.---	Sci. Elective	4	4
23.210	U.S. to 1865	4	4	23.211	U.S. from 1865	4	4
	or				or		
30.180	Amer. Lit.	4	4	30.181	Amer. Lit.	4	4
51.147	M.&M.—Science Elective	4	4		Electives	8	8

## FIFTH YEAR

QUARTER 10				QUARTER 10A				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.---	Sci. Elective	4	4	51.151	Student Teaching & Seminar	8		16.175	Sem. Earth Sci.	4	4
50.151	Bkgs. Am. Ed.	4	4					16.---	Sci. Elective	4	4
90.253	Prof. Devel.	1	1								
	Electives	8	8								

Course descriptions are listed at the back of the catalog in numerical order.

# Specimen Program in Elementary Teaching — Humanities

The Humanities area concentration should be chosen by those students who wish to equip themselves with special strengths in art or music or drama with a view to becoming a resource person in such areas in the elementary school.

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.104	Earth Sci.	4 4	16.105	Earth Sci.	4 4	23.102	West. Civ.	4 4
22.101	Polit. Sci.	4 4	22.102	Polit. Sci.	4 4	30.114	English	4 4
30.113	English	4 4	23.101	West. Civ.	4 4	50.113	Soc. Science	3 3
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3		Elective	4 4

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. Hist. I	4 4	16.122	Nat. Hist. II	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Hum. Dev. & Lrng. I	4 4	50.131	Human. Elective	4 4
	Humanities Elect.	4 4		Hum. Dev. & Lrng. II	4 4

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
51.131	Fund. of Arith. I	4 4	51.132	Fund. of Arith. II	4 4
54.135	Elem. Reading I	4(6) 6	54.136	Elem. Reading II	4(6) 6
	Human. Elective	4 4		Human. Elective	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4	50.141	Meas. & Eval.	4 4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
51.141	Elem. Ed.	4 4	51.142	Elem. Ed.	4 4
	Compend. I	4 4		Compend. II	4 4
	Elective	4 4		Art Elective	4 4
	Human. Elective	4 4		Elective	4 4

## FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	51.151	Student Teaching & Seminar	8	30.181	Amer. Literature	4 4
50.151	Bkgrnds.						Art Elective	4 4
	Amer. Ed.	4 4						
55.121	Intr. Spec Ed.	4 4						
	Elective	4 4						
90.253	Prof. Dev.	1 1						

Course descriptions are listed at the back of the catalog in numerical order.

## Specimen Program in Elementary Teaching Language — Reading

This area concentration is recommended to those students who wish to become language arts and reading specialists in the elementary school and who are planning on graduate study in these areas.

### FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
104	Earth Sci.	4	4	16.105	Earth Sci.	4	4	23.102	West. Civ.	4	4
113	English	4	4	23.101	West. Civ.	4	4	30.114	English	4	4
111	Soc. Science	3	3	50.112	Soc. Science	3	3	50.113	Soc. Science	3	3
	Mod. Lang.	4	4		Mod. Lang.	4	4		Mod. Lang.	4	4

First-year pattern of two-term courses may vary according to assigned section.

### SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.121	Nat. History I	4	4	16.122	Nat. History II	4	4
39.115	Econ. Prin. & Prob.	4	4	29.100	Public Speaking	3	3
50.121	Human Dev. & Lrng. I	4	4		Modern Lang.	4	4
	Modern Lang.	4	4		or		
	Human. Elective	4	4	50.131	Human. Elective	4	4
					Hum. Dev. & Lrng. II	4	4

### THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.120	Intro. Linguistics	4	4	30.121	Found. of Eng.	4	4
51.131	Fund. of Arith. I	4	4	50.141	Meas. & Eval.	4	4
51.135	Anal. Tchg. & Ed. Proc.	4	4	51.132	Fund. of Arith. II	4	4
54.135	Elem. Reading I	4(6)	6	54.136	Elem. Reading II	4(6)	6

### FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
51.141	Elem. Ed. Compend. I	4	4	51.142	Elem. Ed. Compend. II	4	4
54.141	Remedial Reading	4	4	54.142	Linguistics & Reading	4	4
55.131	Dynamics of Speech & Lang. Dev.	4	4		Elective	4	4
				54.151	Children's Lit.	4	4

### FIFTH YEAR

QUARTER 10				QUARTER 10A				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
3.210	U.S. to 1865	4	4	51.151	Student Teaching & Seminar	8		23.211	U.S. after 1865	4	4
0.180	Amer. Literature I	4	4					30.181	Amer. Literature II	4	4
0.151	Bkgrnds. Amer. Ed.	4	4								
0.253	Prof. Dev. Elective	1	1								
		4	4								

Course descriptions are listed at the back of the catalog in numerical order.

### Specimen Program in Elementary Teaching Science — Mathematics

Students who have special interests and abilities in science or mathematics, but who want to teach on the elementary school level should choose this area concentration with a view to becoming the science or mathematics resource person in team teaching or similar situations.

#### FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.104	Fund. Math.	4 4	10.105	Fund. Math.	4 4	23.102	West. Civ.	4
16.104	Earth Science	4 4	16.105	Earth Science	4 4	30.114	English	4
30.113	English	4 4	23.101	West. Civ.	4 4	50.113	Soc. Science	3
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3		Elective	4

#### SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. Hist. I	4 4	16.122	Nat. History II	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. & Lrng. I	4 4	50.131	Hum. Dev. & Lrng. II	4 4
	Sci. Elec.	4 4		Sci. Elec.	4 4

#### THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
51.131	Fund. of Arith. I	4 4	51.132	Fund. of Arith. II	4 4
54.135	Elem. Reading I	4(6) 6	54.136	Elem. Reading II	4(6) 6
51.135	Anal. Tchg. & Ed. Proc.	4 4	50.141	Meas. & Eval.	4 4
	Sci. Elec.	4 4		Sci. Elec.	4 4

#### FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
51.141	Elem. Ed. Compend. I	4 4	51.142	Elem. Ed. Compend. II	4 4
	Sci. Electives	8 8		Human Elec.	4 4
				Sci. Elec.	4 4

#### FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.181	Amer. Literature I	4 4	51.151	Student Teaching & Seminar	8	30.181	Amer. Literature II	4 4
50.151	Bkgrnds. Amer. Ed.	4 4					Elective	4 4
55.121	Int. Spec. Ed.	4 4						
90.253	Prof. Dev.	1 1						
	Human. Elective	4 4						

Course descriptions are listed at the back of the catalog in numerical order.

### Specimen Program in Elementary Teaching Social Sciences

This area concentration should be chosen by students whose special interests are in history, government, geography, anthropology, and sociology, with a view to becoming a resource person in such areas in the elementary school.

#### 1ST YEAR

QUARTER 1			QUARTER 2			QUARTER 3				
Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
04 Earth Sci.	4	4	16.105	Earth Sci.	4	4	23.102	West. Civ.	4	4
01 Polit. Sci.	4	4	22.102	Polit. Sci.	4	4	30.114	English	4	4
13 English	4	4	23.101	West. Civ.	4	4	50.113	Soc. Science	3	3
11 Soc. Science	3	3	50.112	Soc. Science	3	3		Elective	4	4

First-year pattern of two-term courses may vary according to assigned section.

#### 2ND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. History I	4 4	16.122	Nat. History II	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human. Dev. & Lrng. I	4 4	50.131	Hum. Dev. & Lrng. II	4 4

#### 3RD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
51.135	Anal. Tchg. & Ed. Proc.	4 4	50.141	Meas. & Eval.	4 4
51.131	Fund. of Arith. I	4 4	51.132	Fund. of Arith. II	4 4
54.135	Elem. Reading I	4(6) 6	54.136	Elem. Reading II	4(6) 6
	History Elective	4 4		History Elective	4 4

#### 4TH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
51.141	Elem. Ed. Compend. I	4 4	51.142	Elem. Ed. Compend. II	4 4
	History Elective	4 4		Human Elec.	4 4
	Elective	4 4		Social Sci. Elec.	4 4

#### 5TH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
Course		Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
151	Bkgrnds		51.151	Student Teaching & Seminar	8		Elective	4 4
	Amer. Ed.	4 4					Human. Elective	4 4
121	Intr. Spec. Ed.	4 4						
	Elective	4 4						
253	Prof. Dev.	1 1						
	Human. Elective	4 4						

Course descriptions are listed at the back of the catalog in numerical order.

### Specimen Program in Teaching of English

This program prepares English teachers for the junior or senior high school. It provides a basis for specialized graduate study in English as well as in education.

#### FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.104	Earth Sci.	4 4	16.105	Earth Sci.	4 4	23.102	West. Civ.	4
22.101	Polit. Sci.	4 4	22.102	Polit. Sci.	4 4	30.114	English	4
30.113	English	4 4	23.101	West. Civ.	4 4	50.113	Soc. Science	3
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3		Elective	4

First-year pattern of two-term courses may vary according to assigned section.

#### SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.110	Lit. Analysis	4 4	29.100	Pub. Spkg.	3 3
30.174	Engl. Lit. I	4 4	30.111	or	
50.121	Hum. Dev. & Lrng. I	4 4	30.112	Lit. Analysis	4 4
	Elective	4 4	30.175	Engl. Lit. II	4 4
			50.131	Hum. Dev. & Lrng. II	4 4

#### THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
26.150	Intro. to Logic	4 4	30.181	Am. Lit.	4 4
30.180	Am. Lit.	4 4	50.141	Meas. & Eval.	4 4
51.135	Anal. Tchg. & Ed. Prac.	4 4		Elective	4 4
	English Elective	4 4		Art or Music Elec.	4 4

#### FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.120	Intro. Linguistics	4 4	30.121	Fndns. Engl. Lang.	4 4
30.250	Shakespeare	4 4	30.251	Shakespeare	4 4
51.143	M.&M.-English	8 8	26.130	Aesthetics	4 4
			51.139	Writing & Tchg. Writ.	4 4

#### FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
39.115	Econ.	4 4	51.151	Student Teaching & Seminar	8		Elective	4
50.151	Bkgrnds. Amer. Ed.	4 4					U.S. Hist. Elective	4
	English Elective	4 4						
90.253	Prof. Dev.	1 1						
	Sci. Elec.	4 4						

Course descriptions are listed at the back of the catalog in numerical order.

### Specimen Program in Teaching of General Science

This program prepares students for the teaching of science at the junior high school level or in some curricula of the senior high school.

#### FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3				
Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
101 Basic Math.	3	3	10.102 Basic Math.	3	3	10.103 Basic Math.	3	3	3	3
106 Gen. Chem.	4(3)	5	18.132 Ani. Bio.	3(4)	4	12.107 Gen. Chem.	4(3)	5	4(3)	5
31 Gen. Bio.	3(4)	4	30.113 English	4	4	30.114 English	4	4	4	4
11 Soc. Science	3	3	50.112 Soc. Science	3	3	50.113 Soc. Science	3	3	3	3

#### SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.106	Calculus	4 4	10.107	Calculus	4 4
11.171	Basic Physics	4 4	11.172	Basic Physics	4 4
12.144	Org. Chem. I	4(3) 5	12.145	Organic Chem. II	4(3) 5
50.121	Human Dev. & Lrng. I	4 4	50.131	Human Dev. & Lrng. II	4 4

#### THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.131	Oceanography I	4 4	16.132	Oceanography II	4 4
16.141	Prin. of Geology	4 4	16.161	Astronomy	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4	50.141	Meas. & Eval.	4 4

#### FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
51.147	M. & M.-Science	4 4		Science Elective	4 4
	Science Elective	4 4	29.100	Public Spkg.	3 3
	Biol. Elective	4 4		Biol. Elective	4 4

#### FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
Course	Cl.	Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
151 Bkgrnds.			51.151	Student Teaching & Seminar	8		Electives	8 8
Amer. Ed.	4	4						
Electives	12	12						
253 Prof. Dev.	1	1						

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in Teaching of Mathematics

This program prepares mathematics teachers for the junior or senior high school. It provides a basis for specialized graduate study in mathematics as well as in education.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.201	Calculus	5 5	10.202	Calculus	5 5	10.203	Algebra	5
11.151	Physics	4 4	11.152	Physics	4 4	11.153	Physics	4
30.113	English	4 4	23.102	West. Civ.	4 4	30.144	English	4
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3	50.113	Soc. Science	3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.204	Calculus	4 4	10.205	Calculus	4 4
10.206	Algebra	4 4	10.207	Diff. Equat.	4 4
50.121	Human Dev. & Lrng. I	4 4	50.131	Human Dev. & Lrng. II	4 4
	Human. Elective	4 4		Elective	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.208	Probability	4 4	26.151	Symbolic Logic	4 4
26.150	Intro. Logic	4 4	50.141	Meas. & Eval.	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4		Elective	4 4
	Math. Elective	4 4		Math. Elective	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
*10.170	Geometry	4 4	*10.171	Geometry	4 4
50.151	Bkgs. Am. Ed.	4 4	23.211	U.S. from 1865	4 4
51.145	M. & M.-Math.	8 8	29.100	Public Speaking	3 3
				Math. Elec.	4 4

FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
*10.273	Hist. of Math.	4 4	51.151	Student Teaching & Seminar	8	*10.274	Number Theory	4
30.180	Am. Lit.	4 4					Math. Elective	4
	Math. Elective	4 4				30.181	Am. Lit.	4
90.253	Prof. Dev.	1 1						
	Elective	4 4						

\*10.170, 10.171 and 10.273, 10.274 offered in alternate years. 10.273, 10.274 offered in 1971-72. Course descriptions are listed at the back of the catalog in numerical order.



### Specimen Program in Teaching of Modern Languages

This program prepares students to teach foreign languages in the junior or senior high school. Two languages are required, to be chosen from French, German, Italian, Russian, or Spanish. Students in this major usually begin a new language in the freshman year and in the upper years continue the language they studied in high school and the new language begun in college. A total of 40 quarter hours in advanced language courses covering the two languages is required.

#### FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
5.104	Earth Sci.	4 4	16.105	Earth Sci.	4 4	23.102	West. Civ.	4 4
0.113	English	4 4	23.101	West. Civ.	4 4	30.114	English	4 4
0.111	Soc. Science	3 3	50.112	Soc. Science	3 3	50.113	Soc. Science	3 3
	Mod. Lang.	4 4		Mod. Lang.	4 4		Mod. Lang.	4 4

First-year pattern of two-term courses may vary according to assigned section.

#### SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. & Lrng. I	4 4	50.131	Human Dev. & Lrng. II	4 4
	Modern Lang.	4 4			

#### THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Mod. Lang. Elective	4 4		Mod. Lang. Elective	4 4
	Mod. Lang. Elective	4 4		Mod. Lang. Elective	4 4
	Science Elective	4 4		Science Elective	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4	50.141	Meas. & Eval.	4 4

#### FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.120	Intro. Linguistics	4 4	30.171	English Literature	4 4
30.170	English Literature	4 4		Mod. Lang. Elective	4 4
51.140	M. & M.-Mod. Lang.	4 4		Mod. Lang. Elective	4 4
	Mod. Lang. Elective	4 4	51.144	M & M-Mod. Lang.	4 4

#### FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
0.151	Bkgrnds. Amer. Ed.	4 4	51.151	Student Teaching & Seminar	8		Electives	8 8
	Mod. Lang. Elective	4 4						
	Mod. Lang. Elective	4 4						
	Elective	4 4						
0.253	Prof. Dev.	1 1						

Course descriptions are listed at the back of the catalog in numerical order.

Specimen Program in Teaching of Physics

This program prepares physics teachers for the senior high school. It provides a basis for specialized graduate study in physics as well as in education.

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.201	Calculus	5 5	10.202	Calculus	5 5	10.203	Algebra	5 5
11.151	Physics	4 4	11.152	Physics	4 4	11.153	Physics	4 4
30.113	English	4 4	23.102	West. Civ.	4 4	30.114	English	4 4
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3	50.113	Soc. Science	3 3

SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.204	Calculus	4 4	10.205	Calculus	4 4
11.154	Physics	4 4	11.155	Physics	4 4
11.157	Physics Lab.	(3) 1	11.158	Physics Lab.	(3) 1
50.121	Human Dev. & Lrng. I	4 4	29.100	Public Speaking	3 3
	Elective	4 4	50.131	Hum. Dev. & Lrng. II	4 4

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.221	Analysis	4 4	10.222	Analysis	4 4
11.157	Wave Lab.	2(3) 3	11.201	Mechanics II	4 4
11.200	Mechanics I	4 4	11.220	Thermo.	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4	11.271	Elec. Lab.	1(4) 3
			50.141	Meas. & Eval.	4 4

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.230	Mod. Phys.	4 4	10.207	Diff. Equat.	4 4
11.272	Exp. Lab.	1(4) 3	23.211	U.S. after 1865	4 4
23.210	U.S. to 1865	4 4		Elective	4 4
51.147	M. & M. Science	4 4		Phys. Elec.	4 4

FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	51.151	Student Teaching & Seminar	8	30.181	Amer. Literature	4 4
50.151	Bkgrnds.						Physics Elective	4 4
	Amer. Ed.	4 4					Human. Elective	4 4
	Physics Elective	4 4						
	Human. Elective	4 4						
90.253	Prof. Dev.	1 1						

Course descriptions are listed at the back of the catalog in numerical order.

## Specimen Program in Teaching of Social Studies

This program prepares social studies teachers for the junior or senior high school.

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
104	Earth Sci.	4 4	16.105	Earth Sci.	4 4	23.102	West. Civ.	4 4
101	Polit. Sci.	4 4	22.102	Polit. Sci.	4 4	30.114	English	4 4
113	English	4 4	23.101	West. Civ.	4 4	50.113	Soc. Science	3 3
111	Soc. Science	3 3	50.112	Soc. Science	3 3		Elective	4 4

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
26.150	Intro. Logic	4 4	29.100	Public Speaking	3 3
39.115	Econ. Prin. & Prob.	4 4	39.116	Econ. Prin. & Prob.	4 4
50.121	Human Dev. & Lrng. I	4 4	50.131	Hum. Dev. & Lrng. II	4 4

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.125	Modern Europe	4 4	30.181	Amer. Literature	4 4
23.199	Historian's Craft	4 4	39.280	Comp. Econ. Syst.	4 4
30.180	Amer. Literature	4 4	50.141	Meas. & Eval. Elective	4 4
51.135	Anal. Tchg. & Ed. Proc.	4 4			

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkds. Amer. Educ.	4 4	54.126	Sec. Reading	4 4
51.149	M. & M. Social Stud.	8 8		Pol. Sci. Elec.	4 4
				Human. Elective	4 4
				History Elective	4 4

## FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
221	Inter. Relations	4 4	51.151	Student Teaching & Seminar	8		History Elective	4 4
	History Elective	4 4					Sci./Math. Elective	4 4
	Sci./Math. Elective	4 4					Elective	4 4
253	Prof. Dev.	1 1					Elective	4 4
	Elective	4 4						

Course descriptions are listed at the back of the catalog in numerical order.

## Specimen Program in Speech and Hearing Therapy

This is a highly specialized program preparing students for employment in public or private schools as speech and hearing therapists or for graduate study in the field of speech pathology and audiology.

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.104	Earth Sci.	4 4	16.105	Earth Sci.	4 4	23.102	West. Civ.	4 4
22.101	Polit. Sci.	4 4	22.102	Polit. Sci.	4 4	30.114	English	4 4
30.113	English	4 4	23.101	West. Civ.	4 4	50.113	Soc. Science	3 3
50.111	Soc. Science	3 3	50.112	Soc. Science	3 3		Elective	4 4

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
50.121	Human Dev. & Lrng. I	4 4	55.122	Intr. Spch. & Hrng. Ther.	4 4
55.121	Intr. Spec. Ed.	4 4	55.124	Anat Sp. & Hrg.	4 4
55.126	Communic. Skills	4 4	50.131	Hum. Dev. & Lrng. II	4 4

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.135	Personality	4 4	19.136	Personality	4 4
54.135	Elem. Reading I	4 4	55.134	Organic Sp. Disorders	4 4
55.131	Dyn. of Spch. & Lang. Dev.	4 4		Human. Elective	4 4
55.133	Intro. Ling. & Phonetics	4 4		Elective	4 4

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
55.141	M.&M. in Speech	4 4	55.142	Intr. Audiology	4 4
55.143	Diagnosis Sp. & Hrg.	4 4	55.144	Clinical Prac. I	2(6) 4
55.145	Func. Sp. Disorders	4 4		Elective	4 4

## FIFTH YEAR

QUARTER 10			QUARTER 10A			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4	51.151	Student Teaching & Seminar	8	55.152	Speech Reading & Audit Training	4 4
55.155	Clinical Prac. II Human. Elective Sci. or Math. Elective	2(6) 4 4 4 4				55.154	Intr. Stutt.	4 4
90.253	Prof. Dev.	1 1						

Course descriptions are listed at the back of the catalog in numerical order.

# college of engineering

**Melvin Mark, Dean**

**Donald H. MacKenzie, Associate Dean**

**Thomas E. Hulbert, Assistant Dean**

## **General Objectives**

The College of Engineering prepares students to participate constructively in a technologically changing world, contributing to the accumulation and application of new knowledge as professional engineers. Fundamentals are emphasized to provide the future engineer with the basic technical knowledge that will enable him to practice in a variety of positions. At the same time study of the social sciences and humanities provides an opportunity to develop an awareness of the social, economic, political, aesthetic and philosophical influences that are part of the context in which he will practice his profession.

The concept of education as a continuing, lifelong process necessary to work effectively in an environment of constantly changing ideas and newly discovered scientific principles underlines the complete structure of the Engineering curriculum. This curriculum is directed toward assisting the student to understand the basic concepts of the particular branch of engineering he may choose, to comprehend and develop competence in the engineering method and its application, to communicate effectively and succinctly the important results of any technical study, and to acquire the motivation for continuing professional growth.

## **Programs of Study**

The College of Engineering offers five-year cooperative programs in Civil, Mechanical, Electrical, Chemical and Industrial Engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. The curricula of the several departments effectively prepare students to seek employment in industry or to continue their education in graduate schools. The College is operated on the Cooperative Plan.

The undergraduate academic program begins with three quarters of full-time study. Course work during the first year builds the student's understanding of mathematics and the physical sciences, and improves his ability to communicate ideas both by verbal and graphic means.

Since the first year of study is identical for all engineering students, the choice of engineering specialization may be changed at the end of the freshman

year without loss. About four-fifths of the upper-class program is devoted to scientific and technological study, and about one-fifth to humanistic-social courses, with the aim of balancing the student's growing technical proficiency with a similar development of his appreciation of the nontechnical aspects of society and culture.

Cooperative work in the branch of engineering which the student chooses will begin upon completion of the freshman year and continue throughout the remaining upper-class years. Work assignments during this time will prove to be most valuable in helping integrate the important elements of both an engineering and a liberal education. They will be instrumental in teaching the value of teamwork while, at the same time, in giving insight into the problems of actual engineering practice.

Day graduate programs are available in the Departments of Chemical, Civil, Mechanical, Industrial, and Electrical Engineering, leading to the master's degree. These are cooperative programs in engineering similar to the undergraduate cooperative programs. Doctoral programs are available in Electrical, Chemical, Civil and Mechanical Engineering. In addition, the professional degree of Engineer is offered.

#### **Part-Time Program Offered During Evening Hours**

The College of Engineering also offers eight-year curricula leading to the degree of Bachelor of Science in Electrical or Civil Engineering. Classes are held in the evening and Saturday mornings. Admission and course requirements are the same as for the degree under the Cooperative Plan. For further information consult the evening bulletin of the College of Engineering.

#### **Power Systems Electrical Engineering**

In order to meet the needs of the rapidly expanding electric-power industry, Northeastern has initiated a special program in Power Systems Engineering. This program is an accelerated cooperative program which results in a master's degree in six years. The subject matter is basically that of electrical engineering augmented by additional work in power systems, economics, computer control, atomic energy, and direct energy conversion.

#### **Accreditation**

All undergraduate day programs offered in the College of Engineering are fully accredited by the Engineers' Council for Professional Development.

#### **Admission Requirements**

It is important that applicants for admission to the College of Engineering complete successfully the full sequence of secondary school courses in English, mathematics, and science. The following subjects are required:

Subject	Units
English (4 years)	3
Physics and Chemistry	2
Algebra (through quadratics)	2
Plane Geometry and Trigonometry	1½
Other college preparatory subjects	4½
Electives, not more than	2
	<hr/> 15

### **Graduation Requirements**

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. A total of approximately 180 quarter hours is required for the degree. Students who undertake the cooperative education program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive the Bachelor of Science degree until he has completed at least one academic year at Northeastern immediately preceding his graduation.

### *Scholarship Requirements*

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated field of specialization. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

### *Graduation with Honor*

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

### **Engineering Curricula**

To assist students in choosing their fields of specialization, a description of each of the engineering curricula and associated departments together with a short statement of the principal opportunities available to graduates, follows.

## Chemical Engineering Department

Ralph A. Troupe, Professor and Chairman, B.S., M.S., Ph.D., P.E. (Mass., Tex.)

### Associate Professors

Bernard M. Goodwin, B.S., Sc.D.  
Richard R. Stewart, B.S., M.S.,  
Ph.D.  
John A. Williams, B.S., M.S.,  
Ph.D.

### Assistant Professors

Ralph A. Buonopane, B.S., M.S.,  
Ph.D.  
Nicholas W. Prodany, B.S., M.S.,  
Ph.D.

### Instructors

Craig Jackson, B.S., M.S.  
Harry Takach, B.S., M.S.

**Chemical Engineering** has grown out of the discoveries in the chemical laboratories which have served as a foundation for a great many new industries whose production processes involve chemical as well as physical changes. Petroleum refining, plastics, manufacture of nylon and cellophane, and hundreds of other industries require men and women trained in chemistry as well as in engineering. Moreover, much of the training received by the chemical engineer is now being applied in the rapidly developing fields of space engineering and environmental control. Many older industries, such as foods, textiles, paints and varnishes, and leather, are also employing chemical engineers.

The chemical engineer has been defined as a "professional man experienced in the design, construction, and operation of plants in which materials undergo chemical and physical change." It is the task of the chemical engineer to reduce the costs, increase production, and improve the quality of the products in the industry.

Since the field of chemical engineering is so varied, the curriculum has been designed to give the students a broad training in which fundamental principles are stressed. It is believed that this training will enable the students to acclimate themselves readily to whatever industry they may choose to enter.

Because of the complex nature of many chemical processes and because of the difficulty of translating laboratory results into full-scale plant operations, there has been developed in many chemical plants the so-called semi-works or pilot plant. Here new processes developed by the chemists in the research laboratory are put to the test of actual plant conditions. And it is here that the young chemical engineers often find themselves upon graduation. If they are able to understand the chemist on the one side and the plant operator on the other, and if they are technically competent as well, they will soon find opportunities for advancement either in one of the technical branches of the industry, such as design, development, research, and production; or in the sales and management fields in which a knowledge of chemical engineering is essential.

In recent years many graduates have entered graduate school rather than industry. Since the Chemical Engineering Department at Northeastern has active graduate programs leading to the M.S., Ph.D., and D.Eng. degrees, undergraduates are fully prepared for graduate school.



**Specimen Program in Chemical Engineering***Degree: B.S. in Ch.E. Accredited by the E.C.P.D.***FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.106	Basic Eng.	4 4	9.107	Basic Eng.	4 4	10.152	Calculus	4 4
10.150	Calculus	4 4	10.151	Calculus	4 4	11.205	Physics	4 4
11.203	Physics	4 4	11.204	Physics	4 4	12.115	Gen. Chem.	4 4
30.114	Intr. Lit.	4 4	12.114	Gen. Chem.	4 4	30.115	Great Themes in Lit.	4 4

First-year pattern of two-term courses may vary according to assigned section.

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.101	ChE Calc. I	3(3) 4	4.102	ChE Calc. II	4 4
10.153	Calculus	4 4	10.154	Calculus	4 4
11.110	Physics Lab.	0(3) 1	11.111	Physics Lab.	0(3) 1
11.206	Physics	4 4	12.148	Organic Chem.	3(3) 4
12.147	Organic Chem.	3(3) 4	02.165	Mechanics	4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.111	Chem. Eng. I	4 4	4.112	Chem. Eng. II	4 4
10.155	Math.	4 4	10.156	Math.	4 4
12.161	Phys. Chem.	3(3) 4	12.162	Phys. Chem.	3(3) 4
39.125	Economics	4 4	39.126	Economics	4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.121	Trans. Phen. I	4 4	4.122	Trans. Phen. II	4 4
4.123	Exp. Meth. I	2(4) 4	4.124	Exp. Meth. II	2(4) 4
4.126	ChE Thermo.	4 4	4.136	ChE Kinetics	4 4
	Liberal Elective	4 4		Liberal Elective	4 4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	**Res. Tech. Elect.	1(6) 6		**Res. Tech. Elect.	1(6) 6
	*Tech. Elect.	4 4		*Tech. Elect.	4 4
	*Tech. Elect.	4 4		*Tech. Elect.	4 4
	Liberal Elective	4 4		Liberal Elective	4 4

\*One technical elective each quarter must be from the ChE electives offered. The second may be either a ChE elective or a technical elective outside the department. In all cases the elective program must be approved by the ChE department.

\*\*Either Proc. Design 4.131 and 4.132 or Projects 4.133 and 4.134.

## Civil Engineering Department

Ernest L. Spencer, Professor and Chairman, B.S., M.S., P.E. (Mass.)

### Associate Professors

LeRoy M. Cahoon, B.S., M.S.,  
P.E. (Mass.)  
John J. Cochrane, B.S., M.S.,  
Ph.D., P.E. (Mass., N.Y., Vt.)  
Kenneth M. Leet, B.S., M.S.,  
Sc.D., P.E., (Mass., Penn.)  
Joseph H. Lenney, B.S., M.S.,  
P.E. (Mass.)  
Saul Namyet, B.S., P.E. (Mass.,  
N.Y.)  
C. Andrew Pretzer, B.S., M.S.,  
Ph.D., P.E. (Mass.)  
Robert C. Stiefel, B.S., M.S.,  
Ph.D., P.E. (Penn., Mass.)

### Assistant Professors

Frederic C. Blanc, B.C.E., M.S., Ph.D.,  
P.E. (N.Y., Conn., Mass.)  
Lyle E. Branagan, B.S., M.S., P.E.,  
(N.Y.)  
William Domey, B.S., M.S., P.E.  
(Mass.)  
John Fillos, B.S., M.S., Ph.D.  
Constantine J. Gregory, B.A., M.S.,  
Ph.D.  
Dennis R. Horn, B.S., M.S., Ph.D.  
Rajinder K. Khetarpal, B.S., M.S.,  
Ph.D.  
Walter E. Jaworski, A.S., B.S., M.S.,  
Ph.D.  
Thomas Neff, B.S., M.S., Ph.D.  
Paul J. Ossenbruggen, B.S., M.S.,  
Ph.D.

**Civil Engineering** has to do with the planning, design, and construction of many kinds of structures and facilities in private and public works. Each civil engineering project is one of a kind, designed to fit the particular requirements of a single location and purpose. A satisfactory civil engineering design represents the most economical solution to a problem with due regard to its effect on the environment and leads to a structure which will perform adequately over its design life, successfully withstanding all natural forces and applied loads which it is intended to resist.

The urban crisis has created an ever-mounting series of problems that are still in need of satisfactory solutions. Transportation within and between centers of population; the presentation and allocation of land, air, water, and power; the collection, treatment, and disposal of wastes (domestic, industrial and solid); preservation of recreational resources; the provision of housing and preservation of residential values; the rehabilitation of blighted areas—are some of the problems that have not been adequately solved. These problems, along with others in the general area of civilian living requirements, will continue to increase in magnitude and importance as time goes by and as our population continues to expand.

The profession of civil engineering, as old as civilization itself, involves four broad areas of work. These include the planning, design, construction and management of transportation systems, structural systems, environmental control systems, and the integration of these through urban planning systems. The practice of civil engineering is obviously vital to the solution of the contemporary problems in man's environment today and tomorrow.

The practice of civil engineering, although scientifically based, does involve a great deal of the "state-of-the-art" type of engineering. Both the theoretical and

practical aspects of the work concentrate upon the technological aspects of problems involving analysis, design, and construction. Obviously, the direct relationship of civil engineering with people indicates fairly close rapport with sociology, government, politics, and economics.

Since the first step in many civil engineering projects involves accurate measurement of the surface features of the land, of the nature of the soil, and of the character of the underlying rock, the study of surveying, soil mechanics, and foundations occupies a large place in the civil engineering curriculum. And since the primary consideration in designing any structure is to make certain that it will withstand safely any force to which it may be subjected, the mechanics of static bodies, strength of materials, and theory of structures are studied in detail. The curriculum is thus intended to prepare the young civil engineer to take up the work of design and construction of structures, to solve the problems of water supply and waste disposal in urban areas, and to intelligently undertake supervision working in allied fields of engineering and in general contracting.

Upon graduation, the young engineer may expect a period of assistantship either in the field, or in the office involving drafting, surveying, computation and design, construction layout and supervision, and obtaining and analyzing information for studies and reports. As experience is gained, the graduate is entrusted with greater responsibilities in actual design and supervision. Opportunities for employment exist at municipal, state, and Federal levels, in private consulting practice, in general contracting, and in industry. In many specialized areas, the young civil engineer may find that graduate work is a necessary adjunct for successful performance.

## Specimen Program in Civil Engineering

*Degree: B.S. in C.E. Accredited by the E.C.P.D.*

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
9.106	Basic Eng.	4	4	9.107	Basic Eng.	4	4	10.152	Calculus	4	4
10.150	Calculus	4	4	10.151	Calculus	4	4	11.205	Physics	4	4
11.203	Physics	4	4	11.204	Physics	4	4	12.115	Gen. Chem.	4	4
30.114	Intr. Lit.	4	4	12.114	Gen. Chem.	4	4	30.115	Great Themes in Lit.	4	4

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.110	Physics Lab.	0(3)	1	2.130	Thermo.	4	4
10.153	Calculus	4	4	11.111	Physics Lab.	0(3)	1
11.206	Physics	4	4	10.154	Calculus	4	4
39.125	Economics	4	4	39.126	Economics	4	4
1.115	Eng. Meas.	3(3)	4	1.140	Struct. Mech. I	4	4

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	*Math. Elective	4	4		*Math. Elective	4	4
2.116	Dynamics	4	4	1.180	Materials	4	4
1.141	Str. Mechs. II	4	4	1.120	Fluid Mechs. I	4	4
	Liberal Elective	4	4	29.113	Public Speaking	2	1
					Liberal Elective	4	4

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
3.183	Elec. Eng.	4	4	1.193	Environ. Eng. I	4	4
1.172	Soil Mechs.	3(3)	4	1.150	Conc. Design I	4	4
1.143	Struct. Anal. I	4	4		Liberal Elective	4	4
	Liberal Elective	4	4		Tech. Elective		4

## FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.160	Struct. Design	4	4		Liberal Elective	4	4
	Liberal Elective	4	4		Tech. Elective		4
	Tech. Elective		4		Tech. Elective		4
	Tech. Elective		4		Tech. Elective		4
90.257	Prof. Devel.	1	0				

## Technical Electives

QUARTER 9				QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.144	Struct. Anal. II	4	4	1.144	Struct. Anal. II	4	4	1.161	Struct. Des. II	4	4
1.182	Exper. Methods	1(4)	4	5.245	Statistics	4	4	1.144	Struct. Anal. II	4	4
1.134	Transp. Eng.	4	4	1.152	Conc. Des. II	4	4	1.145	Struct. Anal. III	4	4
5.260	Eng. Economics	4	4	1.122	Hydraulic Eng.	4	4	1.174	Foundation Eng.	4	4
				1.175	Eng. Geology	4	4	1.194	Environ. Eng. II	3(4)	4
				**1.101	Spec. Topics		4	1.135	Constr. Eng.	4	4
								1.134	Transp. Eng.	4	4
								1.182	Exper. Methods	1(4)	4
								5.260	Eng. Economy	4	4
								**1.101	Spec. Topics		4

\*Student normally has choice of 10.207, 10.208, 10.146, 10.147.

\*\*See course write-up for details.

## Electrical Engineering Department

Harold R. Raemer, Professor and Chairman, B.S., M.S., Ph.D.

### Professors

Sze-Hou Chang, B.S., M.S., Ph.D.  
 Laurence F. Cleveland, B.S., M.S.  
 Basil L. Cochrun, B.S., M.S.  
 Bell A. Cogbill, B.S., M.S.  
 Ladislav Dolansky, Ing., S.M., E.E.,  
 Ph.D.  
 Welville B. Nowak, B.S., M.S., Ph.D.  
 Benjamin M. Rabinovici, Ing. Dipl.  
 E.E., M.S.E.E., Dr. Sc.  
 Wilfred J. Remillard, B.S., M.S.,  
 Ph.D.  
 J. Spencer Rochefort, B.S., M.S.  
 Martin Schetzen, B.S., S.M., Sc.D.  
 Walter S. Schwab, S.B., S.M., Ph.D.  
 Robert D. Stuart, M.A., Ph.D.,  
 C.Eng.

### Associate Professors

Ralph E. Bach, B.S., M.S., Ph.D.  
 Marcello J. Carrabes, B.S., M.S.  
 James M. Feldman, B.S., M.S., Ph.D.  
 Kenneth I. Golden, B.S., S.M., M.E.,  
 Ph.D.  
 Robert A. Gonsalves, B.S., M.S.,  
 Ph.D.  
 Arvin Grabel, B.S., M.S., Sc.D.  
 Richard Grojean, B.S., M.S.  
 Wayne G. Kellner, B.S., S.M., Sc.D.  
 Walter H. Lob, B.S., M.S.  
 Morton Loewenthal, B.S., Ph.D.  
 Robert N. Martin, B.S., M.S.  
 Louis J. Nardone, B.S., M.S.  
 John Proakis, B.S., M.S., Ph.D.  
 Sheldon S. Sandler, B.S., M.A.,  
 Ph.D.  
 Jacob Wiren, B.S., M.S.

### Assistant Professors

Noel Bernstein, B.S., M.S., Ph.D.  
 Denis Coffey, B.S., M.S., Ph.D.  
 John J. Clark, B.A., M.S., Ph.D.  
 Bob M. Duff, B.S., M.A.  
 Paul Greiling, B.S., M.S., Ph.D.  
 Francis D. McCarthy, B.S., M.S.,  
 Ph.D.  
 James Modestino, B.S., M.S., Ph.D.  
 Lawrence J. O'Connor, B.S., M.S.  
 Robert E. Parkin, B.S., Ph.D.  
 Meng Chi Tsen, B.S., M.S.  
 Lih-Jyh Weng, B.S., M.S., Ph.D.  
 Yash Pal Verma, B.S., M.S., Ph.D.

### Instructors

Richard A. Bean, B.S., M.S.  
 John Kascorowski, B.S., M.S.  
 Nathan D. Phillips, B.S., M.S.  
 Michael Silevitch, B.S., M.S.  
 Elwood W. Streeter, B.S., M.S.

**Electrical Engineering** is a fast-moving field, obtaining much of its impetus from the contemporary pioneering developments in the pure sciences. For this reason, the program of study in electrical engineering includes more work in physics and mathematics than do the other programs and provides a solid grounding in engineering fundamentals as well.

Electrical engineering today embraces a continually widening sphere of activity. It ranges in scope from laboratory and theoretical studies in applied physics to the economic design of communications and energy systems, serving not only the land-based requirements of entire continents but also the needs of space exploration.

Because electrical properties, concepts, instrumentation, and control are basic to much of modern technology, the electrical engineer is often engaged in interdisciplinary activities. Examples are biomedical electronics, electro-optics, and machine translation of languages.

The profession of electrical engineering affords a wide diversification of employment opportunities. If one is research-minded, opportunity to develop one's talents may be found in one of the great university or industrial laboratories; if one is interested in industrial applications or plant problems, opportunity can be found in the manufacturing or operating organizations; and if one is sales-minded, he may find a career as a sales engineer.

**Specimen Program in Electrical Engineering***Degree: B.S. in E.E. Accredited by the E.C.P.D.***FIRST YEAR**

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
9.106	Basic Eng.	4	4	9.107	Basic Eng.	4	4	10.152	Calculus	4	4
10.150	Calculus	4	4	10.151	Calculus	4	4	11.205	Physics	4	4
11.203	Physics	4	4	11.204	Physics	4	4	12.115	Gen. Chem.	4	4
30.114	Intr. Lit.	4	4	12.114	Gen. Chem.	4	4	30.115	Great Themes in Lit.	4	4

First-year pattern of two-term courses may vary according to assigned section.

**SECOND YEAR**

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.153	Calculus	4	4	10.154	Calculus	4	4
11.206	Physics	4	4	11.207	Physics	4	4
3.111	Circ. & Sys. I	4	4	3.112	Circ. & Sys. II	4	4
11.110	Physics Lab. I	0(3)	1	3.131	E.E. Lab. I	(4)	2
	Liberal Elective	4	4	11.111	Physics Lab. II	0(3)	1
					Liberal Elective	4	4

**THIRD YEAR**

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.155	Math.	4	4	10.156	Math.	4	4
2.165	Mechanics I	4	4	2.166	Mechanics II	4	4
3.113	Circ. & Sys. III	4	4	3.122	Circ. & Sys. IV	4	4
3.132	E.E. Lab. II	(4)	2		Liberal Elective	4	4
	Liberal Elective	4	4				

**FOURTH YEAR**

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
3.161	Field Theory	4	4	3.162	Field Theory	4	4
3.141	Electronics	4	4	3.142	Electronics	4	4
2.130	Thermo	4	4	3.133	E.E. Lab.	(4)	2
2.199	Materials Science	4	4	**3.191	Des. & Org. of Dig. Comp.	4	4
					Liberal Elective	4	4
					or Tech. Elect.	4	4

**FIFTH YEAR**

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
3.175	Electromech. Dyn.	4	4	2.196	Materials Sc. or	4	4
3.134	E.E. Lab.	(4)	2	3.191	Des. & Org. of		
	Liberal Elective	4	4		Dig. Comp.		
	*Tech. Electives		8		Liberal Elective	4	4
90.257	Prof. Development	1	0		*Tech. Electives		8

\*Only three technical electives out of the four listed in Quarters 10 and 11 are required for graduation.  
 \*\*3.191 must be taken prior to graduation.

## Electrical Engineering Technical Electives

QUARTER 9			QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.191	Des. & Org. Dig. Comp.	4 4	3.191	Des. & Org. Dig. Comp.	4 4	3.191	Des. & Org. of Dig. Comp.	4 4
3.261	Wave Trans. & Recap.	4 4	3.215	Mod. Cir. Theory	4 4	3.215	Mod. Cir. Theory	4 4
3.215	Mod. Circ. Theory	4 4	3.218	Con. Syst. Theory	4 4	3.222	El. Pwr. Syst.	4 4
3.292	Math Tech. in EE I	4 4	3.221	El. Pwr. Syst.	4 4	3.234	EE Pwr. Lab.	1(3) 2
			3.233	EE Pwr. Lab.	1(3) 2	3.238	Sen. Proj. Lab.	4 2
			3.237	Sen. Proj. Lab.	4 2	3.241	Electronics Seminar	4 4
			3.242	Theo. & Tech. of Sem. Dev.	3(3) 4	3.243	Theo. & Tech. of Semi Dev.	3(3) 4
			3.251	Comm. Theory	4 4	3.251	Comm. Theory	4 4
			3.292	Math Tech. in EE I	4 4	3.261	Wave Trans. & Recap.	4 4
			3.293	Math Tech. in EE II	4 4	3.262	Adv. Topics in E-M	4 4
			3.295	Num. Meth. & Comp. Appl.	4 4	3.292	Math Tech. in EE I	4 4
						3.293	Math Tech. in EE II	4 4
						3.296	Digital Tech.	4 4

## Specimen Program in Electrical Engineering Power Systems

Degree: B.S. in E.E. Accredited by E.P.C.D.

Degree: M.E. in E.E.—Six-Year Program

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.106	Basic Eng.	4 4	9.107	Basic Eng.	4 4	10.152	Calculus	4 4
10.150	Calculus	4 4	10.151	Calculus	4 4	11.205	Physics	4 4
11.203	Physics	4 4	11.204	Physics	4 4	12.115	Gen. Chem.	4 4
30.114	Intr. Lit.	4 4	12.114	Gen. Chem.	4 4	30.115	Intr. Lit.	4 4

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.153	Calculus	4 4	10.154	Calculus	4 4
11.206	Physics	4 4	11.207	Physics	4 4
3.111	Circ. & Sys. I	4 4	3.112	Circ. & Sys. II	4 4
11.110	Physics Lab. I	0(3) 1	3.131	EE Lab. I	(4) 2
	Liberal Elective	4 4	11.111	Physics Lab. II	0(3) 1
				Liberal Elective	4 4

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.155	Math	4 4	10.156	Math	4 4
2.165	Mechanics I	4 4	2.166	Mechanics II	4 4
3.113	Circ. & Sys. III	4 4	3.122	Circ. & Sys. IV	4 4
3.132	EE Lab. II	(4) 2		Liberal Elective	4 4
	Liberal Elective	4 4			

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.161	Field Theory I	4 4	3.162	Field Theory II	4 4
3.141	Electronics I	4 4	3.142	Electronics II	4 4
2.130	Thermo. I	4 4	3.191	Des. & Org. of Dig. Comp or	4 4
3.174	Basic Pwr. Circ.	2 2	2.196	Materials Sci.	4 4
*10.831	Probability	2 2	2.131	Thermo. II	4 4
				Liberal Elective	4 4

\*Graduate courses—To be credited towards M.S. degree.



## FIFTH YEAR

QUARTER 10			
No.	Course	Cl.	Q.H.
3.175	Electomech. Dyn.	4	4
* 3.823	Math. Methods in EE	4	4
3.221	Elec. Pwr. Sys.	4	4
3.233	EE Pwr. Lab.	(4)	2
	Liberal Elective	4	4
90.257	Prof. Devel.	1	0

QUARTER 11			
No.	Course	Cl.	Q.H.
3.176	Machines & Sys.	4	4
4.146	Nuclear Eng.	4	4
3.222	Elec. Pwr. Sys.	4	4
3.234	EE Pwr. Lab.	(4)	2
	Liberal Elective	4	4

## Power Systems

## SIXTH YEAR

QUARTER 12			
No.	Course	Cl.	Q.H.
3.827	Linear Sys. Anal.	4	4
3.928	Anal. of Pwr. Circ.	4	4
3.990	Seminar	2	2
	Electives	6	6

QUARTER 13			
No.	Course	Cl.	Q.H.
3.931	Pwr. Sys. Plng.	4	4
3.944	Spec. Topics in Power	2	2
3.991	Seminar	2	2
	Electives	10	10

Graduate Courses—To be credited towards M.S. degree.

## Industrial Engineering Department

James M. Moore, Professor and Chairman, B.M.E., M.S., Ph.D.

### Professors

Austin W. Fisher, Jr., B.S., Sc.D.  
David R. Freeman, B.S., M.S., Ph.D.

### Associate Professors

Robert S. Green, B.S., M.S., Ph.D.  
Thomas E. Hulbert, B.S., M.S.,  
P.E. (Mass.)

### Assistant Professors

Stewart V. Hoover, B.S., M.S.  
David R. Hall, B.S., M.S.  
Nikhil Parikh, B.S., M.S., Ph.D.  
Jay K. Satia, B.S., M.S., Ph.D.

### Industrial Engineering

Just what is an industrial engineer and in what way is industrial engineering different from the other engineering disciplines? Industrial engineering differs from other branches of the engineering profession in two ways. First it applies to all types of industry, commercial, and governmental activity. Second, it is the only major branch of engineering concerned not only with things but with people. An individual must be able to get along well with people in order to have a successful career in industrial engineering.

Because industrial engineers are a prime source of management talent, they are in demand by a wide variety of industries, including aeronautics and aerospace, data processing, steel, automobile, electronics, retail merchandising, metropolitan transportation, plastics and chemicals, ordnance, and utilities . . . to name a few.

Industrial engineering is invaluable to management in its decision-making when management is faced with problems of the best use of men, material, equipment, and energy to achieve the aims of the organization. The organization may be an entire corporation, a hospital, a government office, an individual department, or any other group organized to make a product or perform a service.

The managers of an organization need factual information, arranged to define different alternatives and their consequences, to help them recognize and solve existing problems. Industrial engineering collects, analyzes, and arranges this information in such a way as to fulfill this need, and at the same time searches for better ways to do the job.

The American Institute of Industrial Engineers, Inc., defines the profession as follows:

"Industrial engineering is concerned with the design, improvement, and installation of integrated systems of men, materials and equipment. It draws upon specialized knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design to specify, predict and evaluate the results to be obtained from such systems."

## Specimen Program in Industrial Engineering

Degree: B.S. in I.E. Accredited by the E.C.P.D.

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
106	Basic Eng.	4	4	9.107	Basic Eng.	4	4	10.152	Calculus	4	4
150	Calculus	4	4	10.151	Calculus	4	4	11.205	Physics	4	4
203	Physics	4	4	11.204	Physics	4	4	12.115	Gen. Chem.	4	4
114	Intr. Lit.	4	4	12.114	Gen. Chem.	4	4	30.115	Great Themes in Lit.	4	4

First-year pattern of two-term courses may vary according to assigned section.

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
41.201	Accounting	4	4	5.128	Work Design	3(3)	4
10.153	Calculus	4	4	5.260	Eng. Economics	4	4
11.206	Physics	4	4	10.154	Calculus	4	4
11.110	Physics Lab.	0(3)	1	39.116	Economics	4	4
39.115	Economics	4	4	11.111	Physics Lab.	0(3)	1

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.165	Mechanics I	4	4	5.147	Statistics I	4	4
3.183	Elect. Eng. Theo.	4	4		*Eng. Sc. Elect.	4	4
10.208	Probability	4	4		Math. Elective	4	4
29.102	Public Speaking	3	3		Liberal Elective	4	4
	Liberal Elective	4	4				

## FOURTH YEAR

QUARTER 8#				QUARTER 9#			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
1.124	Flow of Fluids	4	4	2.130	Thermo. I	4	4
5.148	Statistics II	4	4	5.163	Operations Res. II	4	4
5.161	Operations Res. I	4	4		I.E. Elective	4	4
	Liberal Elective (Behavioral)	4	4		Liberal Elective (Behavioral)	4	4

## FIFTH YEAR

QUARTER 10#				QUARTER 11#			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
5.130	Systems I	4	4	5.131	Systems II	4	4
5.186	Personnel & Organ.	4	4		Tech. Elective	4	4
90.257	Prof. Devel.	1	0		Tech. Elective	4	4
	I.E. Elective	4	4		**Non-Eng. Elect.	4	4
	**Non-Eng. Elect.	4	4				

\*Student must elect a basic engineering science from the following:

3.184	Elect. Engr. Theory II	4
2.146	Mechanics II	4
2.196	Materials Science	4

Advanced students may take an additional elective as overload with approval of their adviser in these quarters.

\*May be in any College other than Engineering with adviser's approval. One of electives in Quarter 10 or 11 must be Liberal Arts, Humanities, or Social Science.

## Mechanical Engineering Department

Arthur R. Foster, Professor and Chairman, B.S., M.Eng.

### Professors

John F. Dunn, S.B., S.M., Sc.D.  
 Melvin Mark, B.S., M.S., Sc.D.  
 Welville B. Nowak, S.B., Ph.D.  
 Joseph J. Zelinski, B.S., Ph.D.

### Associate Professors

Ralph S. Blanchard, Jr., B.S., M.S.  
 Don A. Lautman, B.S., Ph.D.  
 Bertram S. Long, B.S., M.S., M.E.  
 Ernest E. Mills, B.S., M.S.  
 Richard J. Murphy, B.S., M.S., Ph.D.  
 Warren G. Nelson, S.B., S.M., Sc.D.  
 Thomas E. Phalen, Jr., B.S., M.S.  
 John Rossettos, B.S., M.S., Ph.D.  
 Ralph Sexton, B.S., M.S.

Alvin J. Yorra, B.S., M.S.

John Zotos, B.S., M.S., Met.E.

### Assistant Professors

H. Frederick Bowman, B.S., M.S.,  
 Nuc. E., Ph.D.  
 Chang-Chi Chao, B.S., M.S., Ph.D.  
 William W. Chu, B.S., M.S., Ph.D.  
 Bernard Otterman, B.S., M.S.,  
 Ph.D.

### Instructors

John H. Cashman, B.S., M.S.  
 Andrew Levine, B.S., M.S.  
 John Swanson, B.S., M.S.

**Mechanical Engineering** has been defined traditionally as that branch of engineering which deals with the design, development, and manufacture of machinery to do work or produce power. While accurate, this definition does not convey the rapid changes and constant growth which have characterized the field of mechanical engineering.

The mechanical engineer plays an important role in the development of new technologies. For example, he has played a major role in the areas of space technology, direct energy conversion, nuclear power, and materials science. He can be expected to make important contributions in the expanding technologies dealing with the environment, pollution, transportation, ecology, etc.

The curriculum is designed to accommodate the broadening demands upon the mechanical engineer by first establishing a foundation in the basic sciences and then permitting the student the option of directing his studies toward a chosen area of interest. These areas of interest include thermofluid engineering, mechanics and design, and materials science and engineering.

**Thermofluid Engineering** is that branch of mechanical engineering which deals with properties and characteristics of the working fluid of machines. For example, the energy to run a turbine is extracted from steam or combustion gases; the ability of an aircraft to fly depends upon the manner in which air flows over its lifting surfaces; the efficiency with which a heat exchanger operates depends upon the mechanisms by which fluids transfer heat to surfaces. Thermofluid engineering is based upon the sciences of thermodynamics, fluid mechanics, and heat transfer. In the upper-class years, students can pursue their interests in this area by electing advanced courses in these basic sciences as well as courses in nuclear engineering, fluid machinery, jet propulsion, combustion, and direct energy conversion. Graduates with these options are prepared to enter such fields as (1) the electrical power industries, which are concerned with the production of electrical power by conventional steam and nuclear power

stations as well as the production of power by direct energy conversion; (2) propulsion, including conventional internal combustion energy and jet propulsion devices; (3) aircraft and space industry, dealing with flight vehicles and their components; (4) heating and air-conditioning industry; (5) environmental industries, where the specific knowledge of working fluids of machines is necessary to evaluate the effects upon the environment.

**Mechanics and Design** is based upon those fundamental scientific and mathematical tools which are utilized in the analysis of mechanical configurations as they evolve in the design of machines and power-producing devices. Students may elect courses with emphasis in the broad areas of design, applied mechanics, and system dynamics and control.

Provision is made in the design sequence to include, in addition to the traditional machine synthesis experience, an interdisciplinary approach. Here students can work on projects with more general technical and economic considerations, such as transportation systems, pollution control devices, trash disposal, etc. Other students may choose to acquire additional capability in the area of applied mechanics by concentrating on such courses as advanced strength of materials and deformation of solids, experimental stress analysis, vibration, numerical and computer methods in engineering analysis. In the area of system dynamics and control, applications range from the numerical control of machine tools to the complex rigid body dynamics of space travel.

Graduates in the area of mechanics and design can develop a career in many fields, such as transportation, machinery, computers, electronics, aerospace, ocean engineering, power plants, and ordnance. Such engineers will analyze and design plate and shell components for nuclear power plants and deep-sea oceanographic vehicles. They will develop new methods for evaluating filamentary composite structures. In the modern machine tool industry they will be concerned with the computer control of machine tools with associated vibration problems. In the engine industry they analyze stresses in such components as turbine blades. They are needed as members of the interdisciplinary teams found in the computer and electronics companies, where their mechanics and design knowledge is indispensable.

**Materials Science and Engineering** is concerned with understanding the relationships between the structure and properties of materials (principally in the solid state) and with control of the structure to achieve desired properties. Structure refers to the entire range of physical configuration: electronic, atomic, microscopic, and macroscopic. Materials include metals, polymers, glasses, semi-conductors, ceramics, wood, cement, and composite mixtures. Although the importance of the proper engineering use of materials is obvious, engineers only recently have come to appreciate that advances in materials science have made possible a base for a more quantitative control of material properties. Engineers also have come to recognize that an understanding of the principles of materials science enables them to design more creatively and with greater freedom than before. Many engineers must communicate with materials specialists such as metallurgists or ceramists, and this has proven most successful when each knows the concepts and vocabulary of the other. Examples of areas where mechanical engineers find materials properties a part of the basic design function are: manufacturing techniques, structures (vehicles, buildings), energy con-

version, electronic devices (including computers), packaging, and prosthetic devices. Although materials science and engineering is an interdisciplinary subject in its own right, it is included in most engineering core curricula. For those mechanical engineers who desire further knowledge in the materials field, additional courses are available.

**A six-year BS-MS program may be elected by superior students.** Graduate studies are started in the junior and senior years, partly in place of some undergraduate work, and partly as an overload. Enough graduate credits are earned by the end of the senior year so that the 40 quarter hours required for the MS may be completed during a single additional year on the Cooperative Plan.

**Specimen Program in Mechanical Engineering***Degree: B.S. in M.E. Accredited by the E.C.P.D.***FIRST YEAR**

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
9.106	Basic Eng.	4	4	9.107	Basic Eng.	4	4	10.152	Calculus	4	4
10.150	Calculus	4	4	10.151	Calculus	4	4	11.205	Physics	4	4
1.203	Physics	4	4	11.204	Physics	4	4	12.115	Gen. Chem.	4	4
10.114	Intr. Lit.	4	4	12.114	Gen. Chem.	4	4	30.115	Great Themes in Lit.	4	4

First-year pattern of two-term courses may vary according to assigned section.

**SECOND YEAR**

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.165	Mechanics I	4	4	2.166	Mechanics II	4	4
10.153	Calculus	4	4	2.130	Thermo.	4	4
11.206	Physics	4	4	10.154	Calculus	4	4
11.110	Physics Lab.	0(3)	1	11.111	Physics Lab.	0(3)	1
	Liberal Elective	4	4		Liberal Elective	4	4

**THIRD YEAR**

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.131	Thermo.	4	4	2.155	Fluid Mechs. I	4	4
2.167	Mechanics III	4	4	2.196	Materials Sc.	4(3)	5
2.192	Meas. & Anal.	4	4		Math Elective	4	4
	Math Elective	4	4		Liberal Elective	4	4

**FOURTH YEAR**

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	*Elective	4	4		*Elective	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
	Liberal Elective	4	4		Liberal Elective	4	4

**FIFTH YEAR**

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	*Elective	4	4		*Elective	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
	Liberal Elective	4	4		Liberal Elective	4	4
90.257	Prof. Devel.	1	0				

See list of electives below.

**MECHANICAL ENGINEERING ELECTIVE REQUIREMENTS**

**Mechanics:** (2 required)  
Choose one from each group.  
2.270 Selected Topics in Dynamics  
2.171 Mechanical Vibrations  
2.172 System Analysis & Control

**thermodynamics:** (1 required)  
2.150 Heat Transfer

**Materials:** (1 required)  
2.197 Mechanical Behavior of Materials  
2.198 Materials Processing

**Design:** (1 required)  
2.145 Design Fundamentals  
2.146 Mechanical Engineering Design  
2.147 Engineering Design

**Electrical Engineering:**  
One elective course required.

In addition to the electives to be fulfilled as stated above, the remaining elective choices not indicated as Liberal Electives are subject to the following conditions:

- Three courses must comprise a suitable combination of basic science, engineering science, and/or mathematics.
- No more than one course may be taken outside the Colleges of Engineering and Liberal Arts without special permission.

2.168 Strength of Materials A  
2.169 Strength of Materials B  
2.173 Mechanics of Deformable Solids

## Six-Year Option

Degree: M.S. in M.E.

## FOURTH YEAR

Students who have been admitted to the program will take 10.801 and 10.802 as an overload.

## FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
02.801	Cont. Mechs.	2	2	02.802	Cont. Mechs.	2	2
02.860	Systems Eng.	2	2	02.861	Systems	2	2
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4
	Liberal Elective	4	4		Liberal Elective	4	4
90.257	Prof. Devel.	1	0				

## SIXTH YEAR

QUARTER 12				QUARTER 13			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
2.990	Seminar	1	1	2.990	Seminar	1	1
2.991	Thesis		5	2.991	Thesis		5
	Electives	8	8		Electives	8	8

## SIX-YEAR ELECTIVE REQUIREMENTS

Mechanics: (1 required)  
 02.168 Strength of Materials A  
 02.169 Strength of Materials B  
 02.173 Mechanics of Deformable Solids

Thermodynamics: (1 required)  
 02.150 Heat Transfer

Materials: (1 required)  
 02.197 Mechanical Behavior of Materials  
 02.198 Materials Processing

Design: (1 required)  
 02.145 Design Fundamentals  
 02.146 Mechanical Engineering Design  
 02.147 Engineering Design

Electrical Engineering: (1 required)  
 One elective course required.

In addition to the electives to be fulfilled as stated above, the remaining elective choices not indicated as Liberal Arts are subject to the following conditions:

- Three courses must comprise a suitable combination of basic science, engineering science, and/or mathematics.
- No more than one course may be taken outside the Colleges of Engineering and Liberal Arts without special permission.



## **Biophysics and Biomedical Engineering Department**

Samuel Fine, Professor and Chairman, B.A., S.M., M.D.

### **Biophysics and Biomedical Engineering**

Biophysics and biomedical engineering is concerned with the scientific principles underlying the physical and biological sciences and their application to problems of biological significance. Included are investigations of processes associated with biochemical systems within individual cells and within intact organisms.

Among the topics in these areas are: the characterization and mechanisms of action of natural and synthetic macromolecules; analysis of the rheology of macromolecular and heterogeneous systems as exemplified by the circulation of the blood; investigation of the physiological activities of the various components of organ systems such as the nervous system, the respiratory system, the cardiovascular system, and the endocrine system.

Biophysicists and biomedical engineers are engaged in both theoretical and experimental studies, either as independent investigators or as members of a research or development group. The application of coding and information theory to biological transducers and receptor mechanisms, and the effects and uses of electromagnetic and particulate radiation are examples of the areas studied in these scientific disciplines.

Biophysicists and biomedical engineers are also engaged in the design, development, and application of transducers, cardiac pacemakers and defibrillators, artificial hearts, kidneys, and limbs, and diagnostic and therapeutic radiological equipment.

There is no special curriculum in Biomedical Engineering. Several of the engineering disciplines in this catalog provide the engineer with a background in the physical sciences. The purpose of the Department of Biophysics and Biomedical Engineering is to assist the engineering student from his freshman through his senior year in choosing courses in the biological sciences to complement those in the physical sciences and humanities taken in the standard engineering curriculum.

Courses will be chosen without prejudicing the student's obtaining a degree in his field of engineering specialization. In some cases, courses in the biological sciences can be taken as additional course work during the student's career at the University. In other cases, courses in the biological sciences can be taken as electives in the standard engineering curriculum. The opportunity to take these courses is dependent on the student's interests, capabilities, and academic record. It is, of course, limited by schedule conflicts which may occur.

Students who wish to undertake a program in engineering which includes biological sciences must contact the Department of Biophysics and Biomedical Engineering on their arrival as freshmen at the University. This is important since Biology is substituted in the first year for a portion of Basic Engineering.

Since the purpose is to orient the student towards doctoral studies, a student undertaking this program should be highly motivated, academically superior, and possess a high degree of commitment.

Education in a program involving the physical and biological sciences provides a sound foundation for future studies toward a doctorate in medicine or dentistry, or toward a career as a research scientist in a university, hospital, or governmental agency such as the National Aeronautics and Space Administration or the Department of Health, Education and Welfare. Industrial organizations interested in space-oriented or biomedically oriented research are also seeking individuals with qualifications in these areas. Other career opportunities include the marine sciences, the psychological sciences, and public health.

## Graphic Science Department

Wilfred P. Rule, Professor and Chairman, B.S., M.S.

### Associate Professors

Franklyn K. Brown, B.S., M.Ed.  
Borah L. Kreimer, B.S., Ed.M.  
Robert S. Lang, B.S., Ed.M.  
Kenneth S. Woodard, B.S.

### Instructors

Walter D. Herrick, B.S., M.S.  
K. Endre Toth, S.B., M.Ed.

The Department of Graphic Science is primarily responsible for giving the first-year engineering student a first involvement with engineering and confronts him with some of the typical problems he will encounter in his professional career. Some facility with the fundamental tools of engineering is developed by completion of courses in Computer Programming, Engineering Graphics and Introduction to Engineering and Design. Case studies involving problems in several engineering disciplines are analyzed and used to give the student a comprehensive view of engineering in general and to examine some of its special characteristics. As such it is a service department preparing the student for his later courses and professional career.

In addition to preparing the engineering freshman, the Department offers upper-class courses in the College of Liberal Arts, Education, and Business Administration.

# college of liberal arts

**Robert A. Shepard, Dean**

**Ruth Karp, Assistant Dean**

**Robert H. Ketchum, Assistant Dean**

## **Aims**

The College of Liberal Arts seeks to guide young men and women toward intellectual maturity. The mature person is aware of the significant phenomena of the world and has the ability to cope with them effectively and creatively.

To help the student understand the conditions of man's existence, the College of Liberal Arts makes available to him the study of ideas and experiences that are the subject matter of a variety of disciplines. To prepare him to play an effective role in the world, a departmental curriculum helps him to master the concepts and methods of a specific discipline. Detailed study of an academic field is essential to liberal education, for only through specialization can a student acquire insight into the intellectual processes which form the basis of all knowledge. Broader study is equally necessary, for only through a variety of inquiries can a student gain perspective about himself as an individual and about the relevance of his knowledge to society.

Northeastern University's Cooperative Plan contributes to a liberal education by providing valuable opportunities for the student to test and extend his understanding of the complex world and of his special field through direct experience and practical application.

At best, however, the brevity of his own undergraduate experience and the vastness of human experience permit the student only to start his education. Education is an unending process because man's understanding of the world continually changes and grows. Consequently, the most enduring contribution a college of liberal arts can make is to help the individual acquire the skill and motivation to continue his intellectual development throughout his life.

## **Methods**

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of courses is offered. This does not mean that students are free to elect courses indiscriminately. A definite series of basic courses in each curriculum is recommended by the faculty. These basics should be largely concentrated in the first two years of curriculum.

Through a system of faculty advisers, each student is guided in his selection of courses in an effort to provide a total educational experience best suited to his aims and capabilities. During his sophomore year each student selects a major field of specialization and thereafter becomes closely identified with that field, with its faculty and with other students in the same major.

All students in the College of Liberal Arts are eligible to participate in the Cooperative Plan, which provides gainful employment or experiential assignments relevant to the goals of the students. In most of the Liberal Arts majors, students may exercise a choice between the five-year Cooperative Plan and a four-year full-time program.

### Admission Requirements

The College of Liberal Arts offers three broad areas of study. Since the freshman-year program is different in each of these areas, entrance requirements also vary.

All curricula:

Subject	Units
English (4 years)	3
Modern language (at least 2 years)	2
Mathematics (at least 1 year)	1
Science (at least 1 year)	1
Other college preparatory subjects	4
Electives, not more than	4
	<hr/> 15

The following curricula must include these mathematics and science units:

Biology and Chemistry curricula (including Premedical Technology)

Algebra, through quadratics, and Plane Geometry	3 units
Biology and Chemistry	2 units

### Physics and Mathematics Curricula

Applicants are required to show particular strength in mathematics through the full sequence of college preparatory courses. In addition, the successful completion of physics is required.

### Graduation Requirements

#### Degrees

The College of Liberal Arts awards the Bachelor of Arts degree to qualified candidates who have completed one of the curricula outlined on the following pages.

The College of Liberal Arts offers the Bachelor of Science degree to candidates who, during the fifth quarter, formally declare their intention of meeting the program requirements for this degree.

### Quantitative Requirements

A candidate for the Bachelor of Arts or Bachelor of Science must complete eleven academic quarters with a full course load (normally about 16 quarter hours) in each quarter. In a maximum of three quarters, he may carry a load that is lighter by one course (normally about 12 quarter hours). A student who has been granted permission to carry more than a full load for several quarters may graduate after fewer than eleven quarters.

If credit for work elsewhere is transferred to Northeastern, the quantitative requirement will be reduced at the rate of one term for each sixteen quarter hours of transferred credit. However, either the last three full quarters (twelve courses) or at least 75 percent of the credit for the degree must be taken at Northeastern.

### Curricular Requirements

All degree candidates must complete two quarters of Freshman English. In addition, candidates for the Bachelor of Arts must have completed at least 40 hours of credit in courses outside the area of concentration and a language proficiency requirement described below. At least 16 quarter hours must be in each of the two other areas: e.g., 16 quarter hours in one and 24 quarter hours in the other, or 20 quarter hours in each, from the areas of study listed below:

*Humanities:* Art, Drama, Literature, Modern Languages (all courses except those elementary courses which are used to satisfy the language requirement), Music, Philosophy, Journalism, Speech.

*Social Sciences:* Economics, History, Political Science, Psychology (except laboratory courses), Sociology, Anthropology.

*Science and Mathematics:* Biology, Chemistry, Mathematics, Earth Sciences, Physics, Psychology (laboratory courses only).

A candidate for the B.A. must have attained the degree of proficiency in a language other than his mother tongue indicated by passing an intermediate-level college course or by meeting a comparable criterion. This requirement will be regarded as satisfied for students who earned an average grade of C or better in a full four-year language sequence in secondary school and for students for whom English is a foreign language. Other students may satisfy the requirement by passing a proficiency examination. Students who have not met the requirement at matriculation will ordinarily take an intermediate-level course in the language presented for admission, but those with exceptionally weak preparation may be placed in a lower-level course for a quarter. Alternatively, a student may satisfy this requirement with two years (four quarters) of a new language.

*Self-planned Program.* A student may petition the Dean of the College to meet the requirements of the B.A. degree without a departmental major: i.e., with an independent major. The petition must include a proposed program which the student intends to follow. Based on the rationale of his petition he will be assigned to one or more faculty advisers willing to serve as his academic "home base".

Required courses in departmental majors leading to the Bachelor of Arts degree are outlined on the following pages. Upon petition to the faculty, substi-

tutions may be permitted in exceptional cases when required by the specific vocational objective of the student.

Requirements for an independent major and in programs leading to the Bachelor of Science degree should be discussed in advance with a counselor in the Dean's office.

During the last year students in all curricula may take 90.251 Placement Techniques, designed to prepare them for placement in specific positions in their chosen vocational field. Under expert guidance each student prepares a complete personnel record, studies himself or herself and the opportunities that are open, and works out a complete campaign for obtaining after-graduation employment.

Students who undertake the cooperative education program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

### **Qualitative Requirements**

An average grade of C is required for graduation.

### **Graduation with Honor**

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

### *Premedical and Predental students*

A student wishing to study toward a career in medicine or dentistry should arrange a brief interview with the Premedical Advisory Committee as soon as possible after he decides on this goal, for the purpose of learning about the minimal curricular requirements for admission to professional schools, and the scheduling of the required Medical College Admissions and Dental Aptitude Tests. These tests may be taken more than a year before the admission date.

### *Combined Program with Professional Schools*

Students who have completed at least three-quarters of the work required for the baccalaureate degree at Northeastern University before entering an approved professional school of dentistry, law, or medicine, will be granted the Bachelor of Arts degree at the end of the second year in professional school, provided at least two-thirds of the work for the baccalaureate degree has been earned in residence at Northeastern and all other graduation requirements have been fulfilled. The residence requirement at Northeastern University must have been completed immediately prior to entrance into the professional school. Under this plan preprofessional students may reduce by one year the time ordinarily required for obtaining both degrees.

### *Honors Program*

Juniors and seniors with superior accomplishments in their majors and a

high overall average may be invited to do honors work during their last three quarters. Individual departments design their own honors programs which may call for students participating in honors seminars, undertaking independent study, or carrying on a special research project culminating in an honors thesis. Whatever the specific departmental requirements may be, the honors student will be encouraged to develop his own talents and interests, and he will receive careful individual supervision.

The College of Liberal Arts has established these standards for honors work eligibility: a candidate must have a minimum average of 3.0 through the seventh quarter of his college work; he must have no F's or I's, no C's or D's in his major field, and no D's in courses required for graduation outside his major field. Sometimes, with the approval of the major department and the Honors Committee, exceptions can be made. The Honors Committee will invite all eligible students to apply for the program and will review applications from students normally not eligible but asking for special consideration.

The Honors Committee and the candidate's major department will, of course, insist that the work for honors remain consistently excellent. Should a student fall below standard, his program will be subject to review.

#### *For Nurses*

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.



## Art Department

Robert L. Wells, Professor and Chairman, B.S., M.A.

### Associate Professors

Ronald C. Davis, A.B., M.Ed.  
Wheaton A. Holden, A.B., M.A.,  
Ph.D.

### Assistant Professors

Samuel S. Bishop, B.A., M.A.,  
M.F.A.  
Leonard M. Havens, B.S., M.Ed.  
Peter Serenyi, A.B., M.A., Ph.D.

The Art Department offers courses covering the history and evolution of architecture, sculpture, painting, graphic arts, minor arts, photography and film art with emphasis on styles, techniques and cultural implications. Studio art courses are offered for creative expression in various art forms. The objective is to give the student a working knowledge of the structure of art.

## Specimen Program in Art History

*(Five-Year Cooperative)*

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			
No.	Course	Cl.	Q.H.
27.118	Hist. of Art I	4	4
19.105	Gen. Psych. I	3(2)	4
	or		
20.100	Prin. Soc. Anth.	4	4
	Hist. Elect.	4	4
	Mod. Lang.		
	or		
	Elective	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
27.119	Hist. of Art II	4	4
19.106	Gen. Psych. II	3(2)	4
	or		
21.100	Prin. of Soc.	4	4
	Hist. Elect.	4	4
	Mod. Lang.		
	or		
	Elective	4	4

## THIRD YEAR

QUARTER 6			
No.	Course	Cl.	Q.H.
	Art Hist. Electives	8	8
	Electives		8

QUARTER 7			
No.	Course	Cl.	Q.H.
	Art Hist. Elective		8
	Electives		8

## FOURTH YEAR

QUARTER 8			
No.	Course	Cl.	Q.H.
	Art Hist. Electives	8	8
	Electives		8

QUARTER 9			
No.	Course	Cl.	Q.H.
	Art Hist. Electives	8	8
	Electives		8

## FIFTH YEAR

QUARTER 10			
No.	Course	Cl.	Q.H.
	Art. Hist. Electives	8	8
	Electives		8

QUARTER 11			
No.	Course	Cl.	Q.H.
	Art Hist. Electives	8	8
	Electives		8

A total of 56 quarter hours of departmental courses must be taken. All students must take one course in music and philosophy. French, Italian or German is the department language recommendation.

## Specimen Program in Art History

*(Four-Year non-Cooperative)*

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			QUARTER 5			QUARTER 6		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
118	Hist. of Art I	4 4		Art Hist. Electives	8 8	27.119	Hist. of Art II	4 4
105	Gen. Psych I	3(2) 4		Electives	8 8	19.106	Gen. Psych.	3(2) 4
	or						or	
100	Prin. Soc. Anth.	4 4				20.100	Prin. of Soc.	4 4
	Hist. Elect.	4 4					Hist. Elective	4 4
	Mod. Lang.						Mod. Lang.	
	or						Elective	4 4
	Elective	4						

## THIRD YEAR

QUARTER 7			QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Art Hist. Electives	8 8		Art Hist. Electives	8 8		Art Hist. Electives	8 8
	Electives	8 8		Electives	8 8		Electives	8 8

## FOURTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Art Hist. Electives	8 8		Art Hist. Electives	8 8
	Electives	8 8		Electives	8 8

A total of 56 quarter hours of departmental courses must be taken. All students must take one course in music and philosophy. French, Italian or German is the department language recommendation.

## Biology Department

Francis D. Crisley, Professor and Chairman, Ph.D.

### Professors

Fred A. Barkley, Ph.D.  
Charles Gainor, Ph.D.  
Charles M. Goolsby, Ph.D.  
Abdul-Karim Khudairi, Ph.D.  
Nathan W. Riser, Ph.D.

### Assistant Professors

H. David Ahlberg, Ph.D.  
Pooran C. Joshi, Ph.D.  
Britta L. Karlsson, M.S., M.T.  
(ASCP)  
Samuel E. Moyer, Ph.D.  
Shafiq Shukri, AB SM

### Associate Professors

Janis Z. Gabliks, D.D.S., Ph.D.  
Charles Meszoely, Ph.D.  
Patricia Morse, Ph.D.  
Fred A. Rosenberg, Ph.D.  
Henry O. Wernitz, Ph.D.  
Joseph V. Pearincott, Ph.D.

### Lecturers

Dade T. Curtis, M.A.

### Instructor

Kalil S. Boghdan, M.S.

Biological scientists today study all phases of the world of living things from microbes to men. Among the members of the biology faculty are specialists in the study of plants (botany), animals (zoology), and microorganisms (microbiology). Among the other specialties represented are the study of the environment of living things (ecology), their life processes and activities (physiology), and the mechanisms of inheritance (genetics). The Department attempts to present a balanced program of biology ranging from the study of communities of organisms down to the molecular level.

By majoring in Biology a student can also prepare for many different occupations in the biological sciences, and for dentistry, medicine, or teaching.

The program of a Biology major consists of 10 courses in addition to the required chemistry, physics, and mathematics courses given in the specimen program. Six of these are organized into a sequence of required core courses without which the undergraduate biologist cannot function well in taking upper-class electives, pursuing graduate work or in preparing for medical, dental, teaching, or other professional careers. Courses in the "lower tier" of these are 18.131 General Biology, 18.132 Animal Biology, and 18.133 Plant Biology. They are generally prerequisite to the "upper tier," 18.134 Environmental and Population Biology, 18.135 Genetics and Developmental Biology, and 18.136 Cell Biology, and the student is advised to take the core program in its proper sequence prior to taking his minimum of 4 upper-class electives. This is usually possible if the student has decided on his major in his freshman or sophomore year. For students who may decide to enter the major in their middler year, and providing the chemistry, physics, and mathematics requirements can be met, it is possible to complete a major by taking some of the electives concomitantly with core requirements. Transfer students, students with unusual backgrounds or special needs and problems, and others who feel they can qualify for elective courses without meeting the stated prerequisites, are asked to consult with the Department's Undergraduate Advisory and Honors Committee and the course instructor concerning permission to enter the desired courses.

One or more members of the Advisory Committee are usually available for immediate consultation on all types of curriculum matters at any time the need should arise. Their names, and campus addresses are posted in many prominent places within the Department's laboratory and office areas.

The Department also maintains a Preprofessional Advisory Committee composed of Professors Pearincott and Shukri whose responsibility it is to collect and disseminate information about medical, dental, and other professional schools, and send out appropriate letters of recommendation to such schools to whom Biology majors may have applied for admission.

## Specimen Program in Biology

(Five-Year Cooperative)

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.
10.104	Fd. Math	4 4	10.105	Fd. Math	4 4		Elective	
	or			or			or	
10.150	Calc.	4 4	10.151	Calc.	4 4	10.152	Lin. Alg.	4
12.103	Gen. Chem.	4(3) 5	12.104	Gen. Chem.	4(3) 5	12.105	Anal. Chem.	4(6)
	or			or			or	
12.106	Gen. Chem.	4(3) 5	12.107	Gen. Chem.	4(3) 5	12.171	Anal. Chem.	3(3)
18.131	Gen. Bio.	3(4) 4	18.132	An. Bio.	3(4) 4	30.114	English	4
30.113	English	4 4		Mod. Lang.	4 4		Mod. Lang.	4

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.144	Org. Chem. I	3(3) 4	12.145	Org. Chem. II	3(3) 4
18.133	Plant Biology	3(4) 4	18.134	Environ. & Pop.	
10.106	Calculus	4 4		Biology	3(4) 4
	or		10.107	Calculus	4 4
	Elective	4 4		or	
	Mod. Lang.	4 4		Elective	4 4
	or			Mod. Lang.	4 4
	Elective	4 4		or	
				Elective	4 4

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Electives	8		Electives	4
18.135	Gen. & Dev. Bio.	3(4) 4	18.136	Cell Biology	3(4) 4
11.117	Phys. Sci.		11.119	Phys. Sci.	
	Majors I	4 4		Majors II	4
	and			and	
11.124	Gen. Phys. I Lab.	(3) 1	11.125	Gen. Phys. II Lab.	(3) 1
	or			or	
11.171	Bas. Phys. I	4 4	11.172	Bas. Phys. 2	4 4
	and			and	
11.173	Bas. Phys. Lab.	(3) 1	11.174	Bas. Phys. 2 Lab.	(3) 1

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.171	Anal. Chem.	3(3) 4		Bio. Elective	4
	or			Elective	4
12.161	Physical Chem.	3(3) 4		Electives	8
	or				
	Bio. Elective	4			
	Elective	4			
	or				
18.118	Phys. Sci.				
	Majors III	4			

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Biology Elect.	4		Biology Elect.	4
	Electives	12		Electives	12

## Chemistry Department

Karl Weiss, Professor and Chairman, B.S., Ph.D.

### Professors

W. Fay Luder, A.B., Ph.D.  
 Alfred Viola, B.A., M.A., Ph.D.  
 Saverio Zuffanti, B.S., M.A.

### Associate Professors

Fletcher S. Boig, S.B., M.S.,  
 Ed.M.  
 William E. Cass, Ph.B., Ph.D.  
 Bill C. Giessen, Dr. Sc. Nat.  
 David M. Howell, B.S., M.S., Ph.D.  
 Conrad M. Jankowski, B.S., M.S.,  
 Ph.D.  
 Elmer E. Jones, S.B., Ph.D.  
 Barry L. Karger, S.B., Ph.D.  
 John L. Roebber, A.B., Ph.D.  
 Efthalia J. Spinos, B.S., M.S.  
 Robert N. Wiener, A.B., M.S., Ph.D.

### Assistant Professors

Donald C. Claggett, B.S., M.S., Ph.D.  
 Robert B. Davis, B.S., M.S., Ph.D.  
 J. Robert Huber, B.S., M.S., Ph.D.  
 Harry E. Keller, B.S., Ph.D.  
 William M. Reiff, B.A., Ph.D.

### Laboratory Supervisor

Bernard J. Lemire, B.S.

The Chemistry curriculum has three aims: firstly, to provide the intellectual stimulation and discipline of studying a physical science within the context of the liberal arts; secondly, to prepare students for graduate study in chemistry; and finally, to impart a grasp of certain basic principles and techniques important in a variety of careers related to chemistry.

## Specimen B.A. Program in Chemistry

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.201	Calculus I	4	4	10.202	Calculus II	4	4	10.203	Calculus III	4	4
12.103	Gen. Chem.*	4(3)	5	12.104	Gen. Chem.*	4(3)	5	11.117	Physics	4	4
30.113	English	4	4		Ger. or Russ.	4	4	12.105	Anal. Chem.	4(3)	4
	Ger. or Russ.	4	4		Elective**	4	4	30.114	English	4	4

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.118	Physics	4	4	11.119	Physics	4	4
11.124	Physics Lab.	(3)	1	11.125	Physics Lab.	(3)	1
12.153	Org. Chem.	3	3	12.154	Org. Chem.	3(6)	5
	Ger. or Russ.	4	4		Ger. or Russ.		4
	Elective		4		Elective		4

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.155	Org. Chem.	3(6)	5	12.167	Phys. Chem.	3(6)	5
12.166	Phys. Chem.	3	3	12.185	Inorg. Chem.*	2	2
	Electives		8		Electives		8

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
12.168	Phys. Chem.	3(3)	4	12.213	Adv. Inorg. Chem.	4	4
12.179	Chem. Anal.	3(6)	5		Adv. Science or Math Elective		4
	Electives		8		Electives		8

## FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Adv. Chem. Elective		3		Electives		12-16
	Adv. Lab. or Research	(9)	3				
	Electives		6-9				

## Specimen B.S. Program in Chemistry

The B.S. program is the same as the B.A. program, plus the additional courses listed below. The German or Russian language requirement is retained in the B.S. program.

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.204	Calculus IV	4	4	10.205	Calculus V	4	4
				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
				12.253	Ident. Org. Compounds	1(6)	3

\*Students may be excused from these courses by passing an equivalency test. In this case elective may be substituted.

\*\*Recommended elective for premedical students and Chemistry majors interested in biochemistry is Biology (18.131 4 QH). For other Chemistry majors, an elective in social sciences or humanities is recommended.

Consult the Department about variations in the program.



## Drama and Speech Department

Eugene J. Blackman, Professor and Chairman, B.S., M.A.

### Assistant Professors

Carl W. Eastman, B.A., M.A.  
Mort S. Kaplan, B.A., M.A.  
Jerrold Phillips, B.A., M.A.  
Michael L. Woodnick, B.S., M.S.

### Instructors

Barry L. Bailey, B.A., M.S.  
Anthony A. Buglio, B.S., M.S.  
Marcia M. Littlefield, B.A., M.A.  
Catherine L. Rothbard, B.A., M.A.

Studying for the theatre can prepare a student for professional, educational and community theatre (in lighting, designing, publicizing, criticizing, organizing the business forces, preparing budgets, estimating costs, creating and executing costumes, directing, acting, playwriting), and for many other theatre-allied professions — journalistic play reviewing, public relations and advertising, television and radio production and writing, interior decorating. The student of drama can cultivate an understanding and appreciation of one of society's main civilizing forces; develop the creative, emotional, and intellectual powers, the standard of taste and craftsmanship; and bring insight into human behavior and emotion.

## Specimen Program in Drama

(Cooperative)

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			
No.	Course	Cl.	Q.H.
29.150	Acting	4	4
29.200	Hist. of Theater	4	4
19.105	Gen. Psych. I	3(2)	4
	or		
20.100	Prin. Soc. Anthr.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
29.110	Voice and Artic.	4	4
29.201	Hist. of Theater	4	4
19.106	Gen. Psych. II	3(2)	4
	or		
21.100	Prin. Sociology	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

## THIRD YEAR

QUARTER 6			
No.	Course	Cl.	Q.H.
29.170	Scenic Prod.	4	4
	Electives		12

QUARTER 7			
No.	Course	Cl.	Q.H.
	Drama Elective	4	4
	Electives		12

## FOURTH YEAR

QUARTER 8			
No.	Course	Cl.	Q.H.
29.160	Concepts of Dir.	4	4
	Drama Elective	4	4
	Electives		8

QUARTER 9			
No.	Course	Cl.	Q.H.
	Drama Elective	4	4
	Drama Elective	4	4
	Electives		8

## FIFTH YEAR

QUARTER 10			
No.	Course	Cl.	Q.H.
	Drama Elective	4	4
	Drama Elective	4	4
	Electives		8

QUARTER 11			
No.	Course	Cl.	Q.H.
	Drama Elective	4	4
	Drama Elective	4	4
	Electives		8

**Specimen Program in Drama***(Four-Year Non-Cooperative)***FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4			QUARTER 5			QUARTER 6		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
29.150	Acting I	4 4	29.110	Voice & Artic.	4 4	29.201	Hist. of Th.	4 4
29.200	Hist. of Th.	4 4		Drama Elective	4 4	19.106	Gen. Psych. II	3(2) 4
19.105	Gen. Psych. I	3(2) 4		Elective	4 4		or	
	or			Elective	4 4	21.100	Prin. Soc.	4 4
20.100	Pr. Soc. Anthr.	4 4					Mod. Lang.	4 4
	Mod. Lang.	4 4					or	
	Elective	4 4					Elective	4 4
							Drama Elective	4 4

**THIRD YEAR**

QUARTER 7			QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
29.170	Scenic Prod.	4 4	29.160	Concepts of Dir.	4 4		Drama Elective	4 4
	Electives	12		Drama Elective	4 4		Drama Elective	4 4
				Electives	8		Electives	8

**FOURTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Drama Elective	4 4		Drama Elective	4 4
	Drama Elective	4 4		Drama Elective	4 4
	Electives	8		Electives	8

## Earth Sciences Department

J. Rosson Overcash, Professor and Chairman, B.A., A.M.T.

### Associate Professors

Peter B. Corbin, B.S., M.A., Ph.D.  
Bernard L. Gordon, B.S., M.S.  
David L. Wilmarth, B.S., Ed.M.,  
Ph.D.

### Instructors

Conrad K. Casarjian, B.A., M.A.  
Martin E. Ross, B.A., M.A.  
Lauma Silins, B.A., M.A.

### Assistant Professors

Walter Manger, A.B., A.M., Ph.D.  
Lillian Morgenstern, A.B., A.M.,  
Ph.D.  
William A. Newman, A.B., A.M.  
Richard D. Ruggles, A.B., A.M.

The Department of Earth Sciences offers a major in Geology leading to either the Bachelor of Arts or Bachelor of Science degree. While the programs of study are similar, additional science requirements in the Bachelor of Science program take the place of the language requirement in the Bachelor of Arts program. In addition to the required introductory course, as well as courses in minerals and rocks (petrology), the geology student has electives that give him a thorough introduction to the field. More detailed study of a geological specialty would be carried out in graduate school.

In addition to Geology, the Department also offers courses in geography, oceanography and astronomy primarily for two groups of students: 1. Liberal Arts upper-class students desiring an elective in the area; 2. Education students majoring in the teaching of earth sciences.

## Specimen Program in Geology

(Five-Year Cooperative)

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.104	Fd. Math	4	4	10.105	Fd. Math	4	4		Elective		4
10.150	Calc.	4	4		or				or		
12.103	Gen. Chem.	4(3)	5	10.151	Calc.	4	4	10.152	Lin. Alg.	4	4
	or			12.104	Gen. Chem.	4(3)	5	12.105	Anal. Chem.	4(6)	6
12.106	Gen. Chem.	4(3)	5		or				or		
16.141	Phys. Geol.	3(2)	4	12.107	Gen. Chem.	4(3)	5	12.171	Anal. Chem.	3(3)	4
30.113	English	4	4	16.142	Historical Geol.	3(2)	4	30.114	English	4	4
					Mod. Lang.	4	4		Mod. Lang.	4	4

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.146	Mineralogy I	3(4)	4	16.147	Mineralogy II	3(4)	4
11.133	Gen. Physics	4(3)	5	11.134	Gen. Physics	4(3)	5
	or				or		
11.120	Gen. Physics	4(4)	5	11.121	Gen. Physics	4(4)	5
	Elective	4	4		Elective	4	4
	Mod. Language				Mod. Lang.		
	or				or		
	Elective	4	4		Elective	4	4

## THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
16.148	Petrology	3(4)	4		Geology Elective	4	
	Geology Elective		4		Electives	12	
	Electives		8				

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Geology Electives		8		Geology Elective	4	
	Electives		8		Electives	12	

## FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Geology Elective		4	16.170	Senior Seminar		
	Electives		12		Electives		12

## Economics Department

Morris A. Horowitz, Professor and Chairman, Ph.D.

### Professors

Irwin L. Herrnsstadt, Ph.D.  
Gustav Schachter, Ph.D.  
Donald Shelby, Ph.D.

### Associate Professors

Conrad P. Caligaris, Ph.D.  
Bruce Cohen, Ph.D.  
Ernest M. DeCicco, Ph.D.  
Harold M. Goldstein, Ph.D.  
Sidney Herman, M.S.  
Peggy Musgrave, Ph.D.

### Assistant Professors

Douglas Brown, Ph.D.  
Robert D. Cherry, Ph.D.  
David E. Kidder, Ph.D.  
James W. Meehan, Jr., Ph.D.

### Instructors

David L. Anderson, M.A.  
Charlotte Chamberlain, M.A.  
Craig G. Coelen, M.A.  
Chester G. Fenton, M.A.  
Harvey Lapan, M.A.  
Pawan K. Sawhney, M.A.  
Steven M. Swanson, M.A.

Economics is the study of the allocation of scarce resources among alternative ends.

The economics curriculum has a threefold objective: to give the student an understanding of the functioning of the economy; to provide an appreciation of current economic problems and policy; and to provide the student with the basic tools necessary for economic analysis.

Students who satisfactorily complete this curriculum should be prepared to enter a graduate program in economics, government service, or private industry.

**Specimen Program for B.S. in Economics**  
(Five-Year Cooperative)

**FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4			
No.	Course	Cl.	Q.H.
10.104	Fund. of Math.	4	4
39.115	Prin. & Probs. Econ.	4	4
	Social Science Electives		8

QUARTER 5			
No.	Course	Cl.	Q.H.
10.105	Fund. of Math.	4	4
39.116	Prin. & Probs. Econ.	4	4
	Social Science Electives		8

**THIRD YEAR**

QUARTER 6			
No.	Course	Cl.	Q.H.
39.250	Statistics	4	4
39.255	Micro Eco. Th. Electives	4	4
			8

QUARTER 7			
No.	Course	Cl.	Q.H.
39.251	Statistics	4	4
39.256	Macro Eco. Th. Electives	4	4
			8

**FOURTH YEAR**

QUARTER 8			
No.	Course	Cl.	Q.H.
	Econ. Electives	4	12
	Elective		4

QUARTER 9			
No.	Course	Cl.	Q.H.
	Econ. Electives	4	12
	Elective		4

**FIFTH YEAR**

QUARTER 10			
No.	Course	Cl.	Q.H.
39.293	Statistical Methods*		
	or Elective	4	4
	Econ. Electives		8
	Elective		4

QUARTER 11			
No.	Course	Cl.	Q.H.
39.294	Quantitative Methods*		
	or Elective	4	4
	Econ. Electives		8
	Elective		4

\*Major must take either 39.293 or 39.294

Specimen Four-Year Program in Economics  
(Non-Cooperative)

FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

SECOND YEAR

QUARTER 4				QUARTER 5				QUARTER 6			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.104	Fund. of Math.	4	4	19.105	Gen. Psych. I	3(2)	4	10.105	Fund. of Math.	4	4
20.100	Prin. of Soc.			39.250	Statistics	4	4	21.100	Prin. Sociology	4	4
	Anthrop.	4	4		Electives		8	39.116	Prin. of Econ.	4	4
39.115	Prin. of Econ.	4	4						Mod. Lang.	4	4
	Mod. Lang.	4	4						or		
	or								Elective	4	
	Elective	4	4								

THIRD YEAR

QUARTER 7			QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
39.255	Microec. Theory	4 4		Econ. Elective	4 4	19.106	Gen. Psych. II	3(2) 4
	Econ. Elective	4 4		Econ. Elective	4 4	39.251	Statistics	4 4
	Electives	8		Electives	8	39.256	Macroec. Theory	4 4
							Elective	4 4

FOURTH YEAR

QUARTER 10			QUARTER 11				
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Econ. Elective	4	4		Econ. Elective	4	4
	Electives		12		Econ. Elective	4	4
					Electives		8



## English Department

Paul C. Wermuth, Ph.D., Professor and Chairman

### Professors

James T. Barrs, Ph.D.  
Victor E. Howes, Ph.D.  
Samuel F. Morse, Ph.D.  
Franklin Norvish, M.A.  
Reva Stump, Ph.D.

### Associate Professors

Robert J. Blanch, Ph.D.,  
Raymond E. Blois, Ph.D.  
George Khiralla, A.M.  
M. X. Lesser, Ph.D.  
Lloyd A. Skiffington, M.A.  
Stanley Trachtenberg, Ph.D.  
Arthur Weitzman, Ph.D.

### Assistant Professors

Samuel J. Bernstein, Ph.D.  
Andrew Dillon, Ph.D.  
Dennis Flynn, Ph.D.  
Gerald R. Griffin, M.A.  
John Kazantzi, Ph.D.  
James McArdle, M.A.

### Assistant Professors (Continued)

Jane Nelson, Ph.D.  
Robert B. Parker, M.A., Ph.D.  
Martin L. Robbins, Ph.D.  
Kinley Roby, Ph.D.  
Donald Roemer, M.A., Ph.D.  
Ruth E. Sullivan, M.A.  
Joseph Westlund, Ph.D.  
Richard Yoder, Ph.D.

### Lecturer

Joseph B. DeRoche, M.F.A.

### Instructors

Ralph Bevilaqua, M.A.  
Francis Blessington, M.A.  
Michael Finney, M.A.  
Gary Goshgarian, M.A.  
Alicia Korzeniowska, M.A.  
Norma Kroll, M.A.  
Geraldynne McKenna, M.A.  
Brian O'Brien, M.A.  
P. Gila Reinstein, M.A.  
Phyllis Roth, M.A.  
Steven Sands, M.A.  
Evelyn Shakir, M.A.  
Thomas Smythe, M.A.  
Martin Troop, M.A.

The English curriculum is diverse and multifold; it provides training in writing, linguistics, and literature for the general university community; gives substantial preparation in the discipline for those going on to graduate schools in English; and offers intellectual and cultural background for those specializing, or preparing for graduate school, in other fields.

The standard curriculum consists of 13 four-hour courses beyond the freshman English requirement, distributed as follows: English Lit. I (170) and II (171), American Literature I (180); and II (181), Poetry Analysis (110), Fundamentals of the English Language (121), or Introduction to Linguistics (120), Shakespeare (250 or 251), three Figure or Period courses (one each in medieval, eighteenth century, and nineteenth century), two free electives, and a senior seminar course. (This last may be Senior Honors, the Senior Seminar, or one of the "Studies" courses.)

English majors may elect two courses in the Drama Dept., which count toward the major; but those chosen must be drama rather than theatre courses.

English majors may also elect two courses in journalism, as long as they are writing courses.

The specimen curriculum illustrates a reasonable distribution of these requirements, but each English major should see his adviser as early as possible for help with his specific program.

### Specimen Program in English

(Cooperative)

#### FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

#### SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.170	English Lit. I	4	4	30.171	English Lit. II	4	4
23.130	English History	4	4	23.131	English History	4	4
	Soc. Sci. elective		4		Soc. Sci. elective		4
	Mod. Lang.	4	4		Mod. Lang.	4	4
	or				or		
	Elective	4	4		Elective	4	4

#### THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.180	Am. Lit. Figures	4	4	30.181	Am. Lit. Figures	4	4
30.110	Lit. Anal. Poetry	4	4	30.121	Founda. of Eng. Lang.	4	4
	Electives		8		or		
				30.120	Electives		8

#### FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
30.222	Chaucer	4	4	30.250	Shakespeare	4	4
	or				or		
	Medieval Lit.			30.251	Shakespeare	4	4
	English Elective	4	4		Electives		8
	Electives		8				

#### FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
*30.236	18 Cent. Lit.	4	4	*30.241	19 Cent. Lit.	4	4
	or				or		
	Other 18th Cent.				Other 19th Cent.		
	Figure or Period	4	4		Figure or Period	4	4
	English Seminar	4	4		Electives		12
	Electives		8				

\*Any figure or period course in these areas may be substituted.

## History Department

Raymond H. Robinson, Professor and Chairman, Ph.D.

### Professor

Wallace P. Bishop, Ph.D.

### Associate Professors

Philip N. Backstrom, Jr., Ph.D.

Martha E. François, Ph.D.

Norbert L. Fullington, Ph.D.

Norman Rosenblatt, Ph.D.

Stanley R. Stemberge, Ph.D.

### Assistant Professors

Ruth T. Anderson, Ph.D.

William M. Fowler, Jr., Ph.D.

Donald M. Jacobs, Ph.D.

John Post, Ph.D.

Charmarie J. Webb, Ph.D.

### Instructors

Donald Allen, M.A.

Charles C. Buell, M.A.

Ballard C. Campbell, M.A.

Suzanne Hamner, M.A.

Gerald H. Herman, M.A.

Martin Ring, M.A.

### Lecturers

Helen S. Frothingham, M.A.

Ruth Karp, M.A.

Robert H. Ketchum, Ph.D.

The Department of History requires all majors to take the Freshman survey of Western Civilization, the Sophomore survey of American History, and the Middler Course, The Historian's Craft. The remaining 40 credits of history are to be divided among the following groups: 8 credits in Group A — Ancient, Medieval, and Early Modern Europe; 8 credits in Group B — Modern Europe; 8 credits in Group C — British North American Colonies and the United States; 8 credits in Group D — Other Areas or Regions; and 8 credits in any of the four groups. By encouraging courses in various times and places, the Department hopes to minimize overspecialization at the undergraduate level. For the same reason the Department urges students to use their electives for courses outside the discipline of history.

**Specimen Program in History**  
(Cooperative)

**FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4	21.100	Prin. Sociol.	4	4
26.101	Intr. Phil. I	4	4	23.211	U.S. since 1865	4	4
39.115	Prin. & Prob.			39.116	Prin. & Prob.		
	Econ.	4	4		Econ.	4	4
	Mod. Lang.	4	4		Mod. Lang.		
	or				or		
	Elective	4	4		Elective	4	4

**THIRD YEAR**

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
23.199	Hist's Craft	4	4		History Elec.	4	4*
	History Elec.	4	4*		History Elec.	4	4*
	Electives		8		Electives		8

**FOURTH YEAR**

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	History Elec.	4	4*		History Elec.	4	4*
	History Elec.	4	4*		History Elec.	4	4*
	Electives		8		Electives		8

**FIFTH YEAR**

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	History Elec.	4	4*		History Elec.	4	4*
	History Elec.	4	4*		Electives		12
	Electives		8				

\*For information about distribution of History Electives, see Department of History.

**Specimen Program in History**  
(Non-Cooperative)

**FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4			QUARTER 5			QUARTER 6		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
210	U.S. to 1865	4 4	23.199	Hist's Craft	4 4	21.100	Prin. Sociol.	4 4
101	Intr. Phil. I	4 4		History Elec.	4 4*	23.211	U.S. since 1865	4 4
115	Prin. & Prob.			Electives	8	39.116	Prin. & Prob.	
	Econ.	4 4					Econ.	4 4
	Mod. Lang.	4 4					Mod. Lang.	4 4
	or						or	
	Elective	4 4					Elective	4 4

**THIRD YEAR**

QUARTER 7			QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	History Elec.	4 4*		History Elec.	4 4*		History Elec.	4 4*
	History Elec.	4 4*		History Elec.	4 4*		History Elec.	4 4*
	Electives	8		Electives	8		Electives	8

**FOURTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	History Elec.	4 4*		History Elec.	4 4*
	History Elec.	4 4*		Electives	12
	Electives	8			

\*For information about distribution of History Electives, see Department of History.

## Journalism Department

### Associate Professor

George A. Speers, Chairman,  
A.B., M.S., M.Ed.

### Instructors

Caroline I. Ackerman, A.B., M.S.  
Edward F. Quarrington, A.B.  
Robert B. Ruttenberg, A.B.

### Lecturer

Bob Eddy, A.B., M.A.

A total of ten courses is currently offered in the Department of Journalism. They were selected primarily to meet two objectives. First, to meet the requirements of the journalism graduate schools throughout the country. Secondly, to provide a broad understanding of the principles and practices of journalism yet provide applicability to various other disciplines. The currently accepted philosophy in journalism education of a ratio of 80 percent liberal arts courses to 20 percent undergraduate specialized courses serves as a basic guideline in the structuring of the journalism academic programs.

## Specimen Program in Journalism

(Cooperative)

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			
No.	Course	Cl.	Q.H.
23.210	U.S. to 1865	4	4
38.103	News writing	4	4
26.101	Intr. to Phil. I	4	4
20.100	or		
	Prin. of Soc.		
	Anthr.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
23.211	U.S. Since 1865	4	4
38.104	Fund. News writing	4	4
26.102	Intr. to Phil. II	4	4
21.100	or		
	Prin. of Soc.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

## THIRD YEAR

QUARTER 6			
No.	Course	Cl.	Q.H.
30.170	Eng. Lit. I	4	4
38.105	News writing	4	4
	Hist. Elect.	4	4
	Elective		4

QUARTER 7			
No.	Course	Cl.	Q.H.
30.171	Eng. Lit. II	4	4
38.106	Tech. Jour.	4	4
	Hist. Elect.	4	4
	Elective		4

## FOURTH YEAR

QUARTER 8			
No.	Course	Cl.	Q.H.
38.101	Poli. Sci. Elec.	4	4
	H & P Jour.	4	4
	Electives		8

QUARTER 9			
No.	Course	Cl.	Q.H.
38.102	Poli. Sci. Elec.	4	4
	H & P Jour.	4	4
	Electives		8

## FIFTH YEAR

QUARTER 10			
No.	Course	Cl.	Q.H.
38.107	Press & Soc.	2	4
	Eng. Elec.	4	4
	Electives		8

QUARTER 11			
No.	Course	Cl.	Q.H.
38.108	Press & Soc.	2	4
	Eng. Elec.	4	4
	Electives		8

## Mathematics Department

David I. Epstein, Professor and Chairman, A.B., M.S., Ph.D.

### Professors

Robert A. Bonic, M.S., Ph.D.  
Bohumil Cenkí, C.Sc., Sc.D.  
Edward M. Cook, A.B., M.A.  
Holland C. Filgo, B.S., M.A., Ph.D.  
Arshag B. Hajian, M.S., Ph.D.  
Flavio B. Reis, B.S., M.S., Ph.D.  
Giuliano Sorani, Laurea in  
Mathematics  
Gabriel Stolzenberg, A.B., Ph.D.,  
Harold L. Stubbs, A.B., M.A., Ph.D.  
Jack Warga, B.A., Ph.D.

### Assistant Professors

Samuel J. Blank, B.A., Ph.D.  
Mark Bridger, B.A., M.A., Ph.D.  
John Frampton, B.S., M.S., Ph.D.  
Charles J. Freifeld, B.A., M.A.,  
Ph.D.  
Maurice E. Gilmore, A.B., M.S.,  
Ph.D.  
Keith B. Josephson, A.B.,  
A.M., Ph.D.  
Nancy Kopell, A.B., M.A., Ph.D.  
Richard A. Rasala, A.B., A.M., Ph.D.  
Clyde B. Schechter, A.B., M.S., Ph.D.

### Associate Professors

Roger M. Antoine, B.S., M.A.  
Shirley A. Blackett, A.B., M.Ed.  
Edward J. Booth, A.B., Ed.M.  
Bruce Claflin, A.B., M.S.  
Warren C. Dean, A.B., M.A.  
Ellen H. Dunlap, B.A.  
Alberto P. Galmarino, A.B., Ph.D.  
Samuel M. Giveen, A.B., M.A.  
Robert D. Klein, B.S., M.S.  
Norman S. McCallister, A.B., Ed.M.  
Thomas O. Sherman, B.S., Ph.D.  
Victor R. Staknis, B.S., A.M., Ph.D.

The Mathematics Department offers two programs of studies in mathematics: one leading to the degree of Bachelor of Arts; the other to the degree of Bachelor of Science.

The student who pursues the Bachelor of Arts program is required to take a minimum of eleven mathematics courses, which should include 10.181 through 10.187. This student must also take courses in French, German, or Russian.

The Bachelor of Science program is more intensive and requires more than eleven courses in mathematics; however, study of a foreign language is not required.

For more information about these programs, the student should visit the office of the Mathematics Department, Room 504, UR Building.



**Specimen Program in Applied Mathematics**  
(Cooperative)

**FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
0.181	Calculus	5 5	10.182	Calculus	5 5	10.183	Calculus	5 5
1.117	Physics	4 4	11.118	Physics	4 4	11.119	Physics	4 4
10.113	English	4 4	30.114	English	4 4		Mod. Lang.	4 4
	Mod. Lang.	4 4		Elective	4 4		Elective	4 4

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.204	Calculus	4 4	10.205	Calculus	4 4
10.206	Algebra	4 4		or	
11.104	Physics	3 3	10.207	Differ. Equat.	4 4
	and		11.105	Physics	3 3
11.110	Physics, Lab	(3) 1		and	
	or		11.111	Physics Lab	(3) 1
12.135	Gen. Chem.	3(3) 4		or	
	Mod. Lang.	4 4	12.136	Gen. Chem.	4 4
	or			Mod. Lang.	4 4
	Elective	4 4		or	
				Elective	4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.251	Analysis	4 4	10.252	Analysis	4 4
10.208	Probability	4 4	10.220	Math. Stat.	4 4
	Electives	8		Electives	8

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.221	Applied Anal.	4 4	10.222	Applied Anal.	4 4
	Technical El.			Technical El.	
	Electives	8*		Electives	8*

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.223	Numerical Anal.	4 4	10.224	Numerical Anal.	4 4
	Technical El.			Technical El.	
	Electives	8*		Electives	8*

\*For information about Technical Electives please consult your adviser.

Descriptions of programs for upperclassmen will also be available in the Mathematics Department.

Specimen Program in Pure Mathematics  
(Cooperative)

FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cr. Q.H.	No.	Course	Cr. Q.H.	No.	Course	Cr. Q.H.
10.181	Calculus	5 5	10.182	Calculus	5 5	10.183	Calculus	5
11.117	Physics	4 4	11.118	Physics	4 4	11.119	Physics	4
30.113	English	4 4	30.114	English	4 4		Mod. Lang.	4
	Mod. Lang.	4 4		Elective	4 4		Elective	4

SECOND YEAR—as in Applied Program

THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cr. Q.H.	No.	Course	Cr. Q.H.
10.251	Analysis	4 4	10.252	Analysis	4 4
10.254	Algebra	4 4	10.255	Algebra	4 4
	Electives	8		Electives	8

FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cr. Q.H.	No.	Course	Cr. Q.H.
10.253	Analysis	4 4		Math. El.	4 4
	Math. El.	4 4		Electives	12
	Electives	8			

FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cr. Q.H.	No.	Course	Cr. Q.H.
	Math. El.	4 4		Math. El.	4 4
	Electives	12		Electives	12

The program in Pure Mathematics requires successful completion of 16 quarter hours of credit in advanced mathematics courses in addition to the specified courses above. The specimen program shown above is based on the Co-op plan; however, it is possible to major in pure mathematics on a full-time basis. For details consult your adviser.

## Modern Language Department

Louis Cooperstein, Professor and Chairman, B.A., M.A.

### Associate Professors

Israel Aluf, B.A., M.A., Ph.D.  
 Nazzareno F. Cedrone, A.B., A.M.,  
 Ph.D.  
 Benedetto Fabrizi, B.S., M.A., D.M.L.  
 Samuel Jaramillo, Ph.D.  
 Charles E. Kitchin, A.B., M.A.  
 Philip H. Stephan, B.A., M.A., Ph.D.  
 Edward B. Williams, B.A., M.A., Ph.D.

### Assistant Professors

Juliette Gilman, B.A., M.A., Ph.D.  
 Robert B. Modee, B.A., M.A.  
 Linda M. Paterson, B.A., M.A., Ph.D.  
 John Spiegel, B.A., M.A.

### Instructors

Barbara Andrea, B.A., M.A.  
 Elizabeth Boehme, B.A., M.A.  
 James A. Doyle, B.A., M.A.  
 Harry Drake, B.A., M.A.  
 Sonia M. Falkowski, B.A., M.A.  
 Anthony Ford, B.A., M.A.  
 José Guzman, B.A., M.A.  
 Joan Horwitz, B.A., M.A.  
 Audrey Jolliff, B.A., M.A.  
 Betty Landesman, B.A., M.A.  
 Anita Licis, B.A., M.A.  
 Elba Lopez, B.A., M.A.  
 Linda Morse, B.A., M.A.  
 David Pauling, B.A., M.A.  
 Colette G. Raccah, L. en D.  
 Holbrook Robinson, B.A., M.A.  
 Brenda Wegmann, B.A., M.A.

The Department of Modern Languages offers a program leading to a degree in Modern Languages. Students are offered a choice of French, German, Russian, or Spanish. One of these languages will be designated as the major language, with a second as the minor language. In each of the four, the courses offered range from the very basic elementary course to the advanced literature courses for majors. Thus, a student may continue with a language already studied, or he may begin an entirely new language.

In order to major, a student would normally be required to take a minimum of 32 quarter credits in the major language, and 8 quarter credits in the minor. In each case, these credits must be earned in courses **beyond** the intermediate level. (Students whose program permits would be encouraged to study a third language as well.)

## Specimen Program in Modern Languages

*(Cooperative)*

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			
No.	Course	Cl. Q.H.	
23.210	U.S. to 1865	4	4
30.170	Surv. Eng. Lit.	4	4
39.115	Prin. & Prob.		
	Econ.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

QUARTER 5			
No.	Course	Cl. Q.H.	
23.211	U.S. since 1865	4	4
30.171	Surv. Eng. Lit.	4	4
39.116	Prin. & Prob.		
	Econ.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

## THIRD YEAR

QUARTER 6			
No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4
	Electives		12

QUARTER 7			
No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4
	Electives		12

## FOURTH YEAR

QUARTER 8			
No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4
	Electives		8

QUARTER 9			
No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4
	Electives		8

## FIFTH YEAR

QUARTER 10			
No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4
	Electives		8

QUARTER 11			
No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4
	Electives		8

# Philosophy and Religion Department

Walter L. Fogg, Professor and Chairman, A.B., A.M., Ph.D.

## Professor

Charles W. Havice, A.B., A.M.,  
S.T.B., Ph.D., D.D.

## Associate Professors

Edward A. Hacker, A.B., A.M., Ph.D.  
Joseph H. Wellbank, A.B., A.M., Ph.D.

## Assistant Professors

William J. DeAngelis, B.S., M.A.,  
Ph.D.  
Paul Kovaly, Ph.D.  
Gordon E. Pruett, A.B., A.M., Ph.D.

## Instructors

P. M. John, B.A., M.A.  
Michael W. Marlies, B.A., M.A.\*

(\*part-time)

The Department provides balanced curricula for students who have a general interest in philosophy as well as for those who plan to enter graduate education leading to teaching or research in philosophy or related fields. Programs are designed to meet the needs of full-time students, as well as those students participating in the Co-op program.

The programs include courses which strengthen the curricula of other departments and provide all students with a knowledge of the methods and traditions of philosophical and religious thought. Philosophy is of essential importance to a liberal education, providing the student with the opportunity to see the significance and interrelations of human thought in all fields of human endeavor: the natural sciences, the social sciences, and the humanities. It is especially useful as a background for those students who might wish to enter such fields as law, government, social science, and religion.

STUDENTS MAJORING IN PHILOSOPHY must take at least 52 quarter hours in the Department and must meet the following specific requirements:

1. HISTORY OF PHILOSOPHY REQUIREMENT (both of the following):

26.110—History of Ancient Philosophy *and*

26.111—History of Modern Philosophy

To be met, preferably, in the second or third year.

2. LOGIC REQUIREMENT (at least one of the following):

26.150—Introduction to Logic *or*

26.151—Symbolic Logic

To be met, preferably, in the third or fourth year.

The Department emphatically recommends that students contemplating graduate studies in philosophy take 26.151.

3. FIELD REQUIREMENT (at least one of the following):

26.152—Epistemology *or*

26.153—Metaphysics *or*

26.155—Moral Philosophy

To be met, preferably, in the fourth or fifth year.

## 4. ADDITIONAL REQUIREMENTS:

At least ONE SEMINAR (courses numbered from 26.260's):

To be met, preferably, in the fourth or fifth year.

The remaining 32 quarter hours are philosophy electives, to be selected after consultation with the student's Departmental adviser.

## ADVISERS

*Seniors:* Dr. Walter L. Fogg  
Mr. Michael Marlies

*Juniors:* Dr. Edward Hacker  
Dr. Paul Kovaly  
Dr. Joseph Wellbank

*Middlers:* \*Dr. Gordon E. Pruett

*Sophomores:* Dr. William DeAngelis  
\*Mr. P. M. John

(\*Also adviser in Religion)

## Specimen Program in Philosophy

(Five-Year Cooperative Plan)

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			
No.	Course	Cl.	Q.H.
26.110	Hist. Anc. Philos. Electives	4	4
	Mod. Language		8
	or Elective	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
26.111	Hist. Mod. Phil. Electives	4	4
	Modern Lang.		8
	or Elective	4	4

## THIRD YEAR

QUARTER 6			
No.	Course	Cl.	Q.H.
26.150	Intro. Logic	4	4
	or		
26.151	Symbolic Logic	4	4
	Philos. Elective	4	4
	Electives		8

QUARTER 7			
No.	Course	Cl.	Q.H.
	Phil. Elective	4	4
	Electives		12

## FOURTH YEAR

QUARTER 8			
No.	Course	Cl.	Q.H.
26.155	Moral Philos.	4	4
	Phil. Elective		4
	Electives		8

QUARTER 9			
No.	Course	Cl.	Q.H.
	Phil. Electives		8
	Electives		8

## FIFTH YEAR

QUARTER 10			
No.	Course	Cl.	Q.H.
26.26--	Seminar	4	4
	Phil. Elective	4	4
	Electives		8

QUARTER 11			
No.	Course	Cl.	Q.H.
	Phil. Electives	8	8
	Electives		8

**Specimen Program in Philosophy***(Full-Time Four-Year Program)***FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4				QUARTER 5				QUARTER 6			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
5.110	Hist. Anc. Phil. Electives Modern Lang. or Elective	4	4 8	26.111	Hist. Mod. Phil. Electives Modern Lang. or Elective	4	4 8	26.150	Intro. Logic or Symbolic Logic	4	4
		4	4			4	4	26.151	Phil. Elect. Electives	4	4
								26.000		4	8

**THIRD YEAR**

QUARTER 7				QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	QH	No.	Course	Cl.	QH
6.000	Philos. Elect. Electives	4	4 12	26.155	Moral Phil.	4	4	26.000	Phil. Elects. Electives	8	8
				26.000	Phil. Elect. Electives	4	4 8				8

**FOURTH YEAR**

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	QH
26.260	Seminar	4	4	26.000	Philos. Electives	8	8
26.000	Philos. Elect. Electives	4	4 8		Electives		8

## Physics Department

Michael J. Glaubman, Professor and Chairman, Ph.D.

### Professors

Petros N. Argyres, Ph.D.  
 Richard L. Arnowitz, Ph.D.  
 Marvin H. Friedman, Ph.D.  
 Walter Hauser, Ph.D.  
 Giovanni Lanza, Ph.D.  
 Bertram J. Malenka, Ph.D.  
 Eugene J. Saletan, Ph.D.  
 Carl A. Shiffman, Ph.D.  
 Thomas H. Wallace, Ph.D.  
 Roy Weinstein, Ph.D.

### Associate Professors

Ronald Aaron, Ph.D.  
 Alan H. Cromer, Ph.D.  
 Lowell Dworin, Ph.D.  
 David A. Garelick, Ph.D.  
 Marvin W. Gettner, Ph.D.  
 Hyman Goldberg, Ph.D.  
 Bernard A. Gottschalk, Ph.D.  
 Richard A. Grojean, M.S.  
 Pran Nath, Ph.D.

### Associate Professors (Continued)

James E. Neighbor, Ph.D.  
 Clive H. Perry, Ph.D.  
 John F. Reading, Ph.D.  
 Yogi N. Srivastava, Ph.D.  
 Michael T. Vaughn, Ph.D.  
 Eberhard von Goeler, Ph.D.  
 Fa Yueh Wu, Ph.D.

### Assistant Professors

Evangelos M. Anastassakis, Ph.D.  
 Robert I. Boughton, Ph.D.  
 David R. Bowen, Ph.D.  
 William L. Faissler, Ph.D.  
 Gerard J. Dreiss, Ph.D.  
 Robert P. Lowndes, Ph.D.  
 Gerhard Lutz, Ph.D.  
 Yitzhak Y. Sharon, Ph.D.  
 James L. Sigel, Ph.D.  
 Jeffrey B. Sokoloff, Ph.D.  
 Allan Widom, Ph.D.

Physics majors may follow either a regular four-year course of study or the five-year cooperative course of study. Transfers between the four-year and the five-year programs should go smoothly, and registration in either is not an irrevocable decision on the part of the student.

In either case, the available undergraduate physics program is the same and is intended to provide a thorough introduction to classical and modern physics in order to prepare the student for graduate work in physics or engineering, or for entry into industry.

Considerable flexibility is allowed for electives. These enable those students preparing for graduate school in physics to study the subject in depth while others may elect to devote some of their course work to other sciences, to engineering or to non-sciences. The range of courses covered is typical of what will be found in excellent physics curricula throughout the United States. In addition, advanced study and research is available to some undergraduates because of the presence of our graduate programs.

The specimen programs show one way in which a student can arrange to take the maximum physics program. The minimum requirements for the B.A. degree in Physics are five quarters of introductory physics and mathematics in the first and second years plus the following courses beyond the sophomore year:

Physics	3 lecture courses	12 quarter hours
	3 laboratory courses	9 quarter hours
Mathematics	1 course	4 quarter hours



The student is free to meet this minimum requirement in any way which helps him to achieve his educational goals.

### Specimen Program in Physics

(Cooperative)

#### FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.201	Calculus	5	5	10.202	Calculus	5	5	10.203	Calculus	5	5
11.117	Physics	4	4	11.118	Physics	4	4	11.119	Physics	4	4
30.113	English	4	4	30.114	English	4	4				
	*Mod. Lang. or Elective	4	4		Elective		4		*Mod. Lang. or Elective	4	4

#### SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.204	Calculus	4	4	10.205	Calculus	4	4
11.154	Physics	4	4	11.155	Physics	4	4
11.124	Phys. Lab. I Electives	(3) 8	1	11.125	Phys. Lab. II Electives	(3) 8	1

#### THIRD YEAR

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
10.221	Analysis	4	4	10.222	Analysis	4	4
11.200	Mechanics	4	4	11.201	Mechanics	4	4
11.157	Wave Lab. Elective	2(3) 4	4	11.220	Thermodyn.	4	4
				11.271	Electronics Lab.	1(4)	3

#### FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.208	Math. Phys.	4	4	10.207	Diff. Eqtns.	4	4
11.230	Mod. Phys.	4	4		Electives		12
11.272	Exp. Lab. Elective	1(4) 4	3				

#### FIFTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
11.211	Elec. & Mag.	4	4	11.212	Elec. & Mag.	4	4
11.240	Quantum	4	4	11.241	Quantum	4	4
11.273	Adv. Lab. Elective	1(4) 4	3		Electives		8

\*Language not required for B.S. students.

Specimen Program in Physics  
 (Four-Year Non-Cooperative)

FIRST YEAR

Same as for Cooperative Program.

SECOND YEAR

QUARTER 4			QUARTER 5			QUARTER 6		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.204	Calculus	4 4	10.205	Calculus	4 4	10.207	Diff. Equations	4 4
	Electives	12	11.154	Physics	4 4	11.155	Physics	4 4
			11.157	Phys. Lab. Electives	3 8	11.158	Physics Lab. Electives	3 8

THIRD YEAR

QUARTER 7			QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.221	App. Anal. I	4 4	11.208	Math. Phys.	4 4	10.222	App. Anal. II	4 4
11.200	Mech. I	4 4	11.230	Mod. Phys.	4 4	11.201	Mech. II	4 4
11.220	Thermo. Kin. Th.	4 4	11.260	Wave Lab. Elective	2(3) 4	11.272	Exper. Lab. Elective	1(4) 3 4
11.271	Elec. Lab.	1(4) 3						

FOURTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.211	Elect. & Mag. I	4 4	11.212	Elect. & Mag. II	4 4
11.220	Thermo. & Kin. Th.	4 4	11.241	Quantum II	4 4
11.240	Quantum I	4 4		Electives	8
11.273	Adv. Lab.	1(4) 3			

## Political Science Department

R. Gregg Wilfong, Professor and Chairman, A.B., M.A., Ph.D.

### Professor

David W. Barkley, A.B., M.A.,  
Ph.D., M.P.A.

### Associate Professors

L. Gerald Bursey, B.A., A.M., Ph.D.  
Robert L. Cord, B.B.A., M.A., Ph.D.  
Minton F. Goldman, B.A., M.A.,  
M.A.L.D., Ph.D.  
Steve Worth, B.S., Ph.D.

### Assistant Professors

George E. Berkley, A.B., M.P.A., Ph.D.  
Duane L. Grimes, A.B., M.A.  
Walter Jones, M.A.L.D., Ph.D.,  
James A. Medeiros, A.B., Ph.D.  
David G. Pfeiffer, B.A., B.D., M.A.,  
Ph.D.  
David E. Schmitt, B.A., Ph.D.

The undergraduate political science curriculum is designed to prepare a student for graduate study in political science, law, or a career in the public service. It is also a very appropriate major for the student interested in a broad liberal arts education. To accomplish these goals the Political Science major is required to take the following core courses in the major subfields of political science: comparative government, American government, international relations, public administration and political theory. To complement these, electives may be chosen from a variety of courses based on one's own special field of interest.

**Specimen Program in Political Science**  
(Cooperative)

**FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4			
No.	Course	Cl. Q.H.	
22.151	Comp. Govt.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4
	Soc. Sci. Electives	8	8

QUARTER 5			
No.	Course	Cl. Q.H.	
22.221	Intern Relations	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4
	Soc. Sci. Electives	8	8

**THIRD YEAR**

QUARTER 6			
No.	Course	Cl. Q.H.	
	Soc. Sci. Elect.	4	4
	Pol. Sci. Elect.	4	4
	Electives		8

QUARTER 7			
No.	Course	Cl. Q.H.	
	Soc. Sci. Elective	4	4
	Pol. Sci. Elec.	4	4
	Electives		8

**FOURTH YEAR**

QUARTER 8			
No.	Course	Cl. Q.H.	
22.270	Pol. Theory	4	4
	or		
22.273	Pol. Thought I	4	4
	Pol. Sci. Electives	4	4
	Electives		8

QUARTER 9			
No.	Course	Cl. Q.H.	
22.261	Public Admin.	4	4
	Pol. Sci. Elec.	4	4
	Electives		8

**FIFTH YEAR**

QUARTER 10			
No.	Course	Cl. Q.H.	
	Pol. Sci. Electives		8
	Electives		8

QUARTER 11			
No.	Course	Cl. Q.H.	
	Pol. Sci. Electives		8
	Electives		8

## Specimen Program in Political Science

*(Four-Year Non-Cooperative Program)*

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4				QUARTER 5				QUARTER 6			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
22.151	Comp. Govt.	4	4		Electives		8	22.221	Int. Relations	4	4
	or				(Distribution				Mod. Lang.	4	4
	Mod. Lang.	4	4		Requirements)				or		
	or				Soc. Sci. Elect.	4	4		Elect.	4	4
	Elect.	4	4		Pol. Sci. Elect.	4	4		Soc. Sci. Elect.		8
	Soc. Sci. Elect.		8								

## THIRD YEAR

QUARTER 7				QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Soc. Sci. Elective				Pol. Sci. Electives		8	22.261	Public Admin.	4	4
22.270	Pol. Theory	4	4		Electives		8		Pol. Sci. Electives	4	4
	or				(Dist.				Electives		8
22.273	Pol. Thought I	4	4		Requirements)						
	Pol. Sci. Electives	4	4								
	Electives	4	4								

## FOURTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
	Pol. Sci. Electives		8		Pol. Sci. Elective		4
	Electives		8		Electives		12

## Psychology Department

A. Bertrand Warren, Professor and Chairman, A.B., M.A., Ph.D.

### Professors

John C. Armington, B.S., M.S., Ph.D.  
Bertram Scharf, B.A., Ph.D.  
Harold S. Zamansky, B.S., Ph.D.

### Assistant Professors

Thomas R. Corwin, B.S.E.E.,  
M.S.E.E., Ph.D.  
Amy M.L. Schick, B.A., M.S., Ph.D.  
Michael Terman, A.B., M.S., Ph.D.

### Associate Professors

Edward A. Arees, B.B.A., M.S., Ph.D.  
Roger F. Brightbill, A.B., Ph.D.  
Lane K. Conn, B.A., M.A., Ph.D.  
Charles Karis, B.A., M.A., Ph.D.  
Richard I. Lanyon, B.E., M.A., Ph.D.  
Helen B. Mahut, B.A., M.A., Ph.D.

### Research Associates

Jiuan Terman, B.S., A.M., Ph.D.  
Christopher W. Tyler, B.A., M.Sc.,  
Ph.D.

The undergraduate curriculum is designed to prepare students for graduate study in all areas of psychology and in many related fields. In addition, it provides a general cultural major that should enable the student who does not pursue graduate training to understand and evaluate his world of experience more sensitively and perceptively.

Students who plan to major in Psychology should complete the following courses prior to their middler year.

- |                              |   |
|------------------------------|---|
| 1. Foundations of Psychology | 8 Q.H.  |
| 2. Modern Language           | 8 Q.H. The Department recommends French, German, or Russian.      |
| 3. Mathematics               | 8 Q.H. Calculus or Basic Mathematics, depending upon preparation. |
| 4. Science                   | 8 Q.H. The student should select Biology, Chemistry, or Physics.  |

## Specimen Program in Psychology

(Cooperative)

## FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

## SECOND YEAR

QUARTER 4			
No.	Course	Cl.	Q.H.
19.120	Statistics in Psych.	4	4
19.000	Psych. Elect.	4	4
	Lang. or Elect.	4	4
	Elect.	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
19.121	Statistics in Psych.	4	4
19.000	Psych. Elect.	4	4
	Lang. or Elect.	4	4
	Elect.	4	4

## THIRD YEAR

QUARTER 6			
No.	Course	Cl.	Q.H.
19.160	Exp. Psych. I	3(3)	4
19.000	Psych. Elect.	4	4
	Electives		8

QUARTER 7			
No.	Course	Cl.	Q.H.
19.161	Exp. Psych. II	3(3)	4
19.000	Psych. Elect.	4	4
	Electives		8

## FOURTH YEAR

QUARTER 8			
No.	Course	Cl.	Q.H.
19.162	Exp. Psych. III	3(3)	4
	Electives		12

QUARTER 9			
No.	Course	Cl.	Q.H.
19.000	Psych. Elect.	4	4
	Electives		12

## FIFTH YEAR

QUARTER 10			
No.	Course	Cl.	Q.H.
19.210	Hist. of Psych.	4	4
	Electives		12

QUARTER 11			
No.	Course	Cl.	Q.H.
19.211	Systems of Psych.	4	4
	Electives		12

Specimen Program in Psychology  
(Four-Year Non-Cooperative)

FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

SECOND YEAR

FALL				WINTER				SPRING			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
19.120	Stat. in Psych.	4	4	19.000	Psych. Elect.	4	4	19.121	Stat. in Psych.	4	4
	Lang. or Elect.				Electives		12		Lang. or Elect.	4	4
	Electives		8						Electives		8

THIRD YEAR

FALL				WINTER				SPRING			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
19.160	Exp. Psych. I	4	4	19.000	Psych. Elect.	4	4	19.161	Exp Psych. II	3(3)	4
19.000	Psych. Elect.	4	4	19.000	Psych. Elect.	4	4	19.000	Psych. Elect.	4	4
	Electives		8		Electives		8		Electives		8

FOURTH YEAR

FALL				SPRING			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.	
19.162	Exp. Psych. III	3(3)	4	19.211	Systems	4	4
19.210	Hist. Psych.	4	4		Electives		12
	Electives		8				



# Sociology and Anthropology Department

Norman Kaplan, Professor and Chairman, Ph.D.

## Professors

Blanche Geer, Ph.D.  
Frank F. Lee, Ph.D.  
Earl Rubington, Ph.D.  
Stephen Schafer,  
D.Jur., Prof. Agrégé

## Assistant Professors

Patricia Golden, Ph.D.  
David H. Kamens, Ph.D.  
Lila Leibowitz, Ph.D.  
Jack Levin, Ph.D.  
Elizabeth Mandell, M.S.W.

## Associate Professors

M. Catherine Bateson, Ph.D.  
Morris Freilich, Ph.D.  
Elliott A. Krause, Ph.D.  
Morton Rubin, Ph.D.

## Instructor

Marcia Garrett, M.A.

The undergraduate major in Sociology and Anthropology offers a broad spectrum of courses designed to prepare the student for graduate work, and also to provide a general cultural major with opportunity for electives for those who do not desire an advanced degree. The objectives of this program are to discover the basic structure of human society, to identify the main forces that hold groups together or weaken them, and to learn the conditions that transform social life. A major in Sociology or Anthropology would be appropriate for those persons who are interested in a broad liberal arts education.

Students may elect to concentrate in either sociology or anthropology. Each of these alternatives provides the student with a thorough background in the parent fields together with an intensive preparation in the more specific area of his choice.

STUDENTS CONCENTRATING IN ANTHROPOLOGY must take at least 48 quarter hours in departmental courses, including 40 quarter hours in Anthropology and 8 quarter hours in Sociology, and must meet the following minimum requirements:

### A. Preparatory Requirements (all of the following):

- 20.100 Principles of Social Anthropology
  - 21.100 Introduction to Sociology
  - 21.101 Principles of Sociology
- Preferably to be met in the first year.

### B. Core Requirements (at least three of the following):

- 20.130 Language and Culture
  - 20.160 Anthropology of the Family
  - 20.140 Evolution and Society
  - 20.135 Individual and Culture
  - 20.170 Culture in Transition
- Preferably to be met in the second or third year.

### C. Elective Requirements: students must take at least six additional anthropology electives at either the 20.100 or the 20.200 level, and at least one sociology elective.

D. Non-Departmental Requirements (all of the following):

- 19.105-106 General Psychology
- 22.101-102 Introduction to Political Science
- 39.115-116 Principles of Economics

STUDENTS CONCENTRATING IN SOCIOLOGY must take at least 48 quarters in departmental courses, including 40 quarter hours in Sociology and 8 quarter hours in Anthropology, and must meet the following minimum requirements:

A. Preparatory Requirements (all of the following):

- 20.100 Principles of Social Anthropology
  - 21.100 Introduction to Sociology
  - 21.101 Principles of Sociology
- Preferably to be met in the first year.

B. Core Requirements (all of the following):

- 21.239 Statistical Analysis
  - 21.240 Research Methods I
  - 21.241 Research Methods II
  - 21.280 Social Theory I
  - 21.281 Social Theory II
- Preferably to be met in the second or third year.

C. Elective Requirements: students must take at least four sociology electives, two of which should be at the 21.100 level (and preferably to be taken in the second or third year) and two of which should be at the 21.200 level. At least one anthropology elective is also required. Qualified students are encouraged to take 21.800 level graduate courses with the consent of the instructor.

Considerable flexibility is allowed for electives. The specimen programs illustrate only ONE possible way in which the student can choose to fulfill his major requirements. The student is free to meet these requirements in any way that helps him to achieve his educational goals. WE ARE FLEXIBLE. If you have any questions or difficulties, please come by and discuss them with us. Students are encouraged to consult their advisers as early as possible for assistance in planning their program.

Majors may follow either a regular four-year program of study or the five-year cooperative course of study. Cooperative work assignments vary from placement in mental hospitals and social agencies to placement in university, government, and other research laboratories. Transfers between the four-year and the five-year programs should go smoothly, and registration in either is not an irreversible decision on the part of the student.

Departmental requirements are the same for both the Bachelor of Arts and the Bachelor of Science programs. To receive a Bachelor of Arts degree, the student must also fulfill the language and distribution requirements of the College of Liberal Arts. Requirements for the Bachelor of Science degree are set wholly by the Department of Sociology and Anthropology, and are those outlined above.

**Specimen Program in Sociology and Anthropology**

(with a concentration in Sociology)

*(Cooperative)***FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4			
No.	Course	Cl.	Q.H.
19.105	Gen. Psych. I	4	4
21.000	Soc. Elect.	4	4
39.115	Prin. & Prob.		
	Econ.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
19.106	Gen. Psych. II	4	4
21.000	Soc. Elect.	4	4
39.116	Prin. & Prob.		
	Econ.	4	4
	Mod. Lang.	4	4
	or		
	Elective	4	4

**THIRD YEAR**

QUARTER 6			
No.	Course	Cl.	Q.H.
21.280	Soc. Theory I	4	4
21.239	Stat. An.	4	4
	Elective	8	8

QUARTER 7			
No.	Course	Cl.	Q.H.
21.281	Soc. Theory II	4	4
21.000	Soc. Elect.	4	4
	Elective	8	8

**FOURTH YEAR**

QUARTER 8			
No.	Course	Cl.	Q.H.
21.240	Soc. Res.		
	Meth. I	3(2)	4
	Elective	12	12

QUARTER 9			
No.	Course	Cl.	Q.H.
21.241	Soc. Res.		
	Meth. II	3(2)	4
	Elective	12	12

**FIFTH YEAR**

QUARTER 10			
No.	Course	Cl.	Q.H.
21.000	Soc. Elect.	4	4
	Elective	8	8
90.251	Plac. Tech.	1	1

QUARTER 11			
No.	Course	Cl.	Q.H.
21.000	Soc. Elective	4	4
	Elective	12	12

Specimen Program in Sociology and Anthropology  
(with a concentration in Anthropology)  
(Full-time)

FIRST YEAR

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

SECOND YEAR

QUARTER 4				QUARTER 5				QUARTER 6			
No.	Course	Cl.		No.	Course	Cl.		No.	Course	Cl.	
21.000	Soc. Elective	4	4	19.105	Gen. Psych I	4	4	19.106	Gen. Psych II	4	4
	Elective	12	12	39.115	Prin. Econ.	4	4	39.116	Prin. Econ.	4	4
				21.280	Soc. Theory I	4	4	21.281	Soc. Theory II	4	4
					Mod. Lang. or	4	4		Mod. Lang. or	4	4
					Elective	4	4		Elective	4	4

THIRD YEAR

QUARTER 7				QUARTER 8				QUARTER 9			
No.	Course	Cl.		No.	Course	Cl.		No.	Course	Cl.	
21.239	Stat. An.	4	4	21.240	Res. Meth. I	4	4	21.241	Res. Meth. II	4	4
	Anthro El.	4	4		Soc. Elective				Elective		
	Elective	8	8		Elective				Elective		

FOURTH YEAR

QUARTER 10				QUARTER 11			
No.	Course	Cl.		No.	Course	Cl.	
	Soc. Elective	4	4		Soc. Elect.	4	4
	Elective	12	12		Elective	12	12

**Specimen Program in Sociology and Anthropology**

(with a concentration in Anthropology)

*(Cooperative)***FIRST YEAR**

Students in this program carry during the freshman year, which consists of three quarters, two quarters of English plus a pattern of five other courses of two quarters each, at least one elected from each of the fields of science-mathematics, the humanities, and the social sciences. The normal load is four courses each quarter.

**SECOND YEAR**

QUARTER 4			
No.	Course	Cl.	Q.H.
19.105	Gen. Psych. I	4	4
20.000	Core Elect.	4	4
39.115	Prin. & Prob. Econ.	4	4
	Mod. Lang. or Elective	4	4

QUARTER 5			
No.	Course	Cl.	Q.H.
19.106	Gen. Psych II	4	4
20.000	Core Elect.	4	4
39.116	Prin. & Prob. Econ.	4	4
	Mod. Lang. or Elective	4	4

**THIRD YEAR**

QUARTER 6			
No.	Course	Cl.	Q.H.
20.000	Core Elect.	4	4
	Electives	12	12
	(Distribution requirements)		

QUARTER 7			
No.	Course	Cl.	Q.H.
	Anthro Elect.	8	8
	Electives	8	8
	(Distribution requirements)		

**FOURTH YEAR**

QUARTER 8			
No.	Course	Cl.	Q.H.
	Anthro. Elect.	8	
	Electives	8	

QUARTER 9			
No.	Course	Cl.	Q.H.
	Anthro. Elect.	4	
	Electives	12	

**FIFTH YEAR**

QUARTER 10			
No.	Course	Cl.	Q.H.
	Anthro. Elect.	4	
	Electives	12	

QUARTER 11			
No.	Course	Cl.	Q.H.
	Electives	16	

## Music Department

Roland Nadeau, Professor and Chairman, B.M., M.M.

### Associate Professors

Herbert Silverman, M.M., M.Ed.,  
Ed.D.

Leo Snyder, B.M., M.M.

William A. Tesson, B.M., M.M.

### Part-Time Instructor

Raymond Smith, B.M., M.M.

### Lecturer

Carl J. Atkins, B.M.

### Assistant Professors

Joan C. Bicknell, B.S., M.A., Ph.D.

Reginald Hachey, B.M., M.M., A.D.

Helen Keaney, B.M., M.M.

The Music Department provides students an opportunity to gain an initial experience in music or to add to previous experience. To this end the Department offers a varied program made up of:

1. **Synoptic courses** for students who might take only a single course.
2. **Course sequences** for students who wish to study some particular aspect of music in depth.

# college of nursing

**Juanita O. Long, Dean**

## **Professor and Dean**

Juanita O. Long, R.N., M.S.N.

## **Associate Professors**

Lydia Bosanko, R.N., M.A.

Janet Carroll, R.N., M.S.N.

Elizabeth Gates, R.N., M.S.N.

Mary Gonyow, R.N., M.A.

Barbara Goodfellow, R.N., M.S.N.

Marjorie Johns, R.N., M.S.N.

Jane Lee, R.N., M.S.N.

## **Assistant Professors**

Flora DeScenza, R.N., M.S.N.

Ann Egan, R.N., M.S.

Mary Patricia Kane, R.N., M.S.

Elizabeth Norman, R.N., M.A.

Joyce Tingle, R.N., M.S.N.

Mary Wilcox, R.N., M.S.

Delaine Williamson, R.D., M.S.

## **Instructors**

Helen Ahearn, R.N., B.S.

Margie Barry, R.N., B.S.

Susan Bentley, R.N., B.S.

Ruth Brown, R.N., M.S.N.

Joan Burke, R.N., M.S.

Elaine Capozzoli, R.N., B.S.

Nancy Carr, R.N., M.S.

Lael Cutler, R.D., M.P.H.

Ellen Daly, R.N., M.S.N.

Patricia Dean, R.N., M.S.

Rosemary Donovan, R.N., B.S.

Olivia Gagnon, R.N., M.Ed.

Jean Hannan, R.N., M.S.N.

M. Marcia Lynch, R.N., M.S.N.

Rose MacKenzie, R.N., M.S.

Susan Marchessault, R.N., M.S.N.

Anne O'Brien, R.N., M.S.

Jeanne Otto, R.N., M.S.

Janice Puopolo, R.N., M.S.N.

Joyce Quilty, R.N., B.S.

Rose Seereiter, R.N., M.S.N.

Marilyn Smith, R.N., M.S.

Barbara Sullivan, R.N., B.S.

## **Purpose and Plan of the College**

The College of Nursing offers two distinct educational programs which prepare individuals to practice nursing. One is three years in length and leads to the degree of Associate in Science; the other is five years in length and leads to the degree of Bachelor of Science. Both programs accept qualified male and female applicants.

The associate degree curriculum is designed for students who meet the general requirements for admission to college and who are strongly motivated toward giving direct patient care. All instruction is at the college level, but all courses are not identical in content with those given in the first three years of the curriculum leading to the Bachelor of Science degree.

The baccalaureate degree curriculum in nursing is designed for students who meet the requirements for admission to college and who desire to pursue a professionally oriented educational program in nursing. Its purpose is to prepare students to practice professional nursing in a variety of settings. It serves as a foundation for further professional development and graduate study.

At no point can there be direct transfer from one program to the other.

**Methods**

In common with the other Basic Colleges at Northeastern, the curricula of the College of Nursing are distinctive in that they operate on the Cooperative Plan, which the University has long applied to technical and professional curricula in many fields. Each student has practical experience as a paid employee of one of the cooperating health agencies in addition to college instruction. The cooperative work does not carry academic credit. During their periods of employment, students have an opportunity to increase their nursing skills and to earn a major part of their expenses.

The College of Nursing programs combine general education courses with nursing courses concurrently to provide the learning foundation for the practice of nursing. The nursing major is planned in sequential order and draws on the content from the physical, biological and social sciences and from the humanities. New teaching technologies (programmed learning, television, etc.) are used to assist in meaningful presentation of course content.

**The Cooperative Plan in Nursing**

Cooperative work placements are arranged by the Nursing Coordinator in accordance with agreements entered into by the University and the following Boston hospitals:

- Beth Israel Hospital
- Children's Hospital Medical Center
- Massachusetts General Hospital
- New England Deaconess Hospital
- Peter Bent Brigham Hospital

Each of the hospitals has agreed to employ students from both Associate Degree and Baccalaureate Degree programs and to provide a suitable sequence of work experiences.

Assignment of students to cooperative work at specific hospitals is a function of the Department of Cooperative Education. The cooperative work experience is a requirement for the degree and students are expected to accept placement at any one of the collaborating hospitals. Student preferences as to assignment will be given consideration in conjunction with other factors but final decision as to hospital assignment must rest with the Nursing Coordinator.

Placement for cooperative work at a hospital other than those listed above can be permitted only under special circumstances and then only upon a petition approved by the Nursing Coordinator.

**Admission Requirements**

Candidates for admission to the College of Nursing must have been graduated from an accredited secondary school and have the recommendation of the school principal or guidance officer. The following subject-matter credits are required as preparation for the nursing curriculum:

Associate Degree Program	
Subjects	Units
English (4 years)	3
Mathematics	2
Sciences	2



Other college preparatory subjects	6
Electives, not more than	2
	<hr/> 15

### Baccalaureate Degree Program

Subjects	Units
English (4 years)	3
Mathematics	3
Biology, Physics or Chemistry	2
Other college preparatory subjects	7
	<hr/> 15

Other factors considered by the Department of Admissions are the physical fitness of the candidate and the degree of interest and motivation for the field of nursing. Full health clearance is required prior to matriculation.

### Graduation Requirements

#### *Degrees*

The College of Nursing offers two distinct programs: a three-year program leading to the degree Associate in Science and a five-year program leading to the degree Bachelor of Science in Nursing.

#### *Quantitative Requirements*

Candidates for the degree of Associate in Science or Bachelor of Science must successfully complete all of the prescribed courses in the applicable curriculum. For the Associate in Science degree this totals 110 quarter hours. For the Bachelor of Science degree this totals 172 quarter hours including two hours of physical education. They must also carry out effectively the prescribed periods of cooperative work at one or more of the health agencies associated with the University in the program of nursing education.

#### *Qualitative Requirements*

The degree conferred not only represents the formal completion of the curriculum, but also indicates competence for beginning service as a staff nurse. An overall scholarship average of C is required for graduation.

#### *Graduation with Honor*

Candidates for the bachelor's degree whose academic achievement is extraordinary will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or highest honor. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

#### *Registration*

The program of the College prepares students for the professional examinations established by the Board of Registration in Nursing of the Commonwealth of Massachusetts. Students normally take these examinations for licensure as registered nurses shortly after graduation.

Specimen Program in Nursing  
Baccalaureate Degree

FIRST YEAR

QUARTER 1					QUARTER 2					QUARTER 3				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.141	Biology	3	4	4	12.106	Gen. Chem.	4	3	5	12.107	Gen. Chem.	4	3	
23.101	Wes. Civ.	4	4		18.142	Biology	3	4	4	18.148	Anatomy	3	3	
30.113	English	4	4		30.114	English	4	4		23.102	Wes. Civ.	4	4	
80.201	Nsg.	2	2	3	80.202	Nursing	2	2	3	80.203	Nsg.	2	2	

SECOND YEAR

QUARTER 4					QUARTER 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.120	Microbio.	3	4	4	18.126	Physio.	2	3	3
18.125	Physio.	2	3	3	19.106	Fd. of Psych. II	4	4	4
19.105	Fd. of Psych. I	4	4		20.100	Soc. Anthro.	4	4	
80.204	Nsg.	4	3	5	80.205	Nsg.	4	3	5

THIRD YEAR

QUARTER 6					QUARTER 7				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
19.141	Gr. & Dev.	4	4		19.130	Soc. Psych.	4	4	
21.100	Prin. Soc.	4	4		19.142	Gr. & Dev. II	4	4	
80.206	Nsg.	5	9	8	*81.201	Med/Surg. Nsg.	3	18	9
						or			
					82.201	Mat-Child Nsg.	3	18	9
						or			
					83.201	Psych. Nsg.	4	15	9

FOURTH YEAR

QUARTER 8					QUARTER 9				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
26.101	Intr. Phil. I	4	4		26.102	Intr. Phil. II	4	4	
*81.201	Med-Surg. Nsg.	3	18	9	*81.201	Med-Surg. Nsg.	3	18	9
	or					or			
82.201	Mat. Child Nsg.	3	18	9	82.201	Mat-Child Nsg.	3	18	9
	or					or			
83.201	Psych. Nsg.	4	15	9	83.201	Psych. Nsg.	3	18	9
	Elective	4	4			Elective	4	4	

FIFTH YEAR

QUARTER 10					QUARTER 11				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
84.201	Pub. Hith. Nsg.	6	12	9		Elective (optional)		4	
	Electives (2)	8	8		85.201	Contemporary Nursing	TBA	TBA	9
	One course in statistics recommended.								

\*These courses are offered in Quarters 7, 8, 9.  
A total of sixteen (16) quarter hours of electives must be taken to meet the graduation requirements of quarter hours.

**Specimen Program in Nursing**  
*Associate Degree*

**FIRST YEAR**

QUARTER 1					QUARTER 2					QUARTER 3				
Course	Cl.	L.	Q.H.		No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
101 Fd. Nsg.	4	(4)	5		80.102 Fd. Nsg.	4	(4)	5		80.103 Fd. Nsg.	4	(4)	5	
107 Intgrtd. Sci.	4	(3)	5		30.113 English	4		4		30.114 English	4		4	
102 Basic Psych.	4		4		18.108 Intgrtd. Sci.	4	(3)	5		18.109 Intgrtd. Sci.	4	(3)	5	
					19.141 Gr. & Devel.	4		4		19.142 Gr. & Devel.	4		4	

**SECOND YEAR**

QUARTER 4					QUARTER 5				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
*81.101	Med-Surg.				**82.101	Mat. Child	6	(18)	12
	Nsg.	6	(15)	11		Nsg.			
19.201	Abn. Psych.	4		4	21.100	Prin. Soc.	4		4

**THIRD YEAR**

QUARTER 6					QUARTER 7				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
**81.102	Med-Surg.				**83.101	Psych. Nsg.	3	9	6
	Nsg.	3	9	6	22.177	Amer. Pol.			
90.254	Prof. Devel.	1		1		Proc.	4		4
	Electives			8		Elective	4		4

\*81.101 and 82.101 may be taken in Quarter 4 or 5

\*81.102 and 83.101 may be taken in Quarter 6 or 7

Two quarter hours of *Physical Education* are required for graduation. This can be scheduled sometime during the three years, according to the student's programs and availability of courses.

# college of pharmacy and allied health professions

**LeRoy C. Keagle, Dean**

**Arnold S. Goldstein, Assistant Dean**

## **Accreditation**

Each of the programs offered by the College is accredited by the appropriate professional group. The College holds membership in both the American Association of Colleges of Pharmacy and the Association of Schools of Allied Health Professions.

## **Objectives**

Northeastern University recognizes the increased demand for well-educated pharmacists and allied health professionals. The College of Pharmacy and Allied Health Professions is pledged to meet this need by combining its unique Cooperative Plan of Education with a highly innovative academic program, designed to prepare students effectively to become professional practitioners, to enter graduate schools, and to accept employment in the many areas responsible for the delivery of health care.

## **Degrees Granted**

The degrees of Bachelor of Science, Bachelor of Science in Pharmacy, and Associate in Science are awarded to qualified candidates.

### **Pharmacy**

#### **Professors**

O. James Inashima, B.S. in Pharm.,  
M.S., Ph.D.  
LeRoy C. Keagle, B.S. in Pharm.,  
Ph.D.  
George M. Krause, B.S. in Pharm.,  
M.S.  
John L. Neumeyer, B.S., in Pharm.,  
Ph.D.  
Robert F. Raffauf, B.S., M.S.,  
Ph.D.  
John F. Reinhard, Chairman,  
Pharmacology, B.S., M.S., Ph.D.  
Pierre F. Smith, Chairman,  
Pharmacy and Pharmacy  
Administration, B.S., in Pharm.,  
Ph.D.

Albert H. Soloway, Chairman,  
Medicinal Chemistry, B.S., Ph.D.  
Elliot Spector, B.S. in Pharm.,  
Ph.D.

#### **Associate Professor**

Arnold S. Goldstein, B.S. in Pharm.,  
M.S.B.A., J.D.

#### **Assistant Professors**

Donald L. MacKeen, B.S. in Pharm.,  
M.S., Ph.D.  
Joseph F. Palumbo, B.S., M.S. in  
Pharm.  
Victor D. Warner, B.S. in Pharm.,  
Ph.D.

#### **Lecturer**

John W. Webb, B.S., M.S. in Pharm.

Fundamental to the College's approach to pharmaceutical education is:

1. A curriculum of highly relevant and closely integrated courses in the physical, biological, behavioral, and administrative sciences comprising the basis of modern professional pharmaceutical practice.
2. A responsiveness to the individual career goals of our students and the capabilities of structuring a course of study that will serve their individual needs.
3. A meaningful involvement in the clinical aspects of patient care via affiliations with teaching hospitals and related institutions.
4. A cooperative internship program under the guidance of qualified professional practitioners—to enable our students the opportunity to acquire the skills and actual experience considered an integral part of the total program.
5. A commitment to the search and advancement of new and progressive concepts, ideas, and philosophies of pharmaceutical education and professional practice.

### **Career Opportunities**

The continued demand for pharmacy practitioners is likely to increase in the future in direct response to increased populations, greater emphasis on health care, and in particular to the newer and more diversified utilization of the pharmacist in a consultative and clinical capacity.

Of the 128,000 pharmacists now in practice in this country, the majority are associated with community practice. Approximately one half of the community pharmacists are self-employed. Hospital pharmacy and institutional practice have attracted over 10,000 practitioners. Pharmacy also offers careers in research, production, administration, law enforcement, and education.

An ever-increasing number of women are finding satisfying careers in pharmacy. At present, 22 percent of the enrollment in pharmacy colleges consists of women.

### **Program of Study**

The College offers a five-year curriculum which leads to the degree of Bachelor of Science in Pharmacy. This curriculum conforms to the standards established by The American Council on Pharmaceutical Education and the American Association of Colleges of Pharmacy. It includes instruction in each of three natural divisions: (1) nonscientific courses in general education (the humanities and social studies); (2) mathematics and the basic physical and biological sciences; and (3) courses in the areas of professional instruction: medicinal chemistry, pharmacognosy, pharmacology, pharmacy and pharmacy administration.

In addition, through its Graduate School of Pharmaceutical Sciences, programs leading to the Master of Science and Doctor of Philosophy degrees are offered.

### Facilities

The College occupies the Mugar Life Sciences Building on the Main Campus of the University. Completed in 1963, this multi-million dollar facility offers proximity to all the academic and extra-curricular activities of the University.

The building was so designed as to fully anticipate the physical needs of a growing and progressive college. Accordingly, the College enjoys spacious and well-equipped laboratories and classrooms for both its undergraduate and graduate programs, and its courses in dispensing and physical pharmacy, industrial pharmacy, pharmacy administration, medicinal chemistry, analytical chemistry, pharmacognosy, and pharmacology. Radio-isotope laboratories, a pharmaceutical manufacturing plant, clinical pharmacy laboratories, animal rooms, and complete audio-visual capabilities are also featured in this five-story structure.

### Admission Requirements

It is important that applicants for admission to the College have studied the college preparatory curriculum. In particular, such students should be able to demonstrate strength in the sciences and mathematics. The following subjects are required:

Subject	Units
English (4 years)	3
Foreign Language (2 years)	2
Science (Biology and Chemistry)	2
Mathematics	3
Other college preparatory subjects	3
Electives, not more than	2
	<hr/> 15

### Transfer with Advanced Standing

The College of Pharmacy and Allied Health Professions may accept qualified transfer students who have successfully completed one or more years of pre-professional course work in an accredited college or university.

A candidate for advanced standing should:

1. Have had courses which enable him to enter at the beginning of the second or third year and thereafter continue as a regular student.
2. Have earned average grades or better in his previous collegiate studies. No credit is given for the lowest passing mark. Transfer students are admitted only in September.

### Graduation Requirements

Degree: Bachelor of Science in Pharmacy

#### *Quantitative Requirements*

Candidates for the Bachelor of Science in Pharmacy degree must complete all of the prescribed work of the curriculum.

Students who undertake the cooperative education program must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least eight quarters of academic work immediately preceding graduation has been completed at Northeastern.

No student transferring from another college of pharmacy is eligible to receive a degree until at least three quarters of academic work immediately preceding graduation has been completed at Northeastern.

### *Qualitative Requirements*

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an overall average of C. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

### *Graduation with Honor*

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for a least eight quarters before they become eligible for honors at graduation.

### *Licensure*

Pharmacists must meet certain requirements to obtain a license from the state in which they wish to practice. These requirements ordinarily include: graduation from an accredited college of pharmacy, passing an examination given by a State Board of Pharmacy, and completing an "internship" or apprenticeship.

The internship is a period—usually one year—of supervised practical experience in a pharmacy, which at Northeastern University, may be accomplished during the cooperative work periods in the second, third, and fourth years of the five-year curriculum. During the periods of full-time employment, the salary received enables the student to pay a major part of his educational expenses.

## Specimen Program in Pharmacy

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.
10.101	Basic Math. or	3	3	10.102	Basic Math. or	3	3	10.103	Basic Math. or	3	
10.111	Calculus	3	3	10.112	Calculus	3	3	10.113	Calculus	3	
18.131	Biology	3	(4) 4	12.105	Gen. Chem.	4	(3) 5	12.107	Gen. Chem.	4	(3)
23.101	Western Civ. or	4	4	18.132	Biology	3	(4) 4	23.102	Western Civ. or	4	
	Mod. Lang.	4	4	71.202	Pharm. Orient.	1	1		Mod. Lang.	4	
30.113	English	4	4					30.114	English	4	
71.201	Pharm. Orient.	1	1								

## SECOND YEAR

QUARTER 4				QUARTER 5			
No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
11.171	Basic Physics	4	4	11.172	Basic Physics	4	4
12.144	Org. Chem.	4	(3) 5	12.145	Org. Chem.	4	(3) 5
19.105	Psychology	4	4	18.148	Human Anat.	3	(3) 4
21.100	Sociology or	4	4	29.108	Bus. & Prof.		
	Elective	4	4		Spkg.	4	4
					or		
					Elective	4	4

## THIRD YEAR

QUARTER 6				QUARTER 6A				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.
71.210	Pharm. Calc.	2	2	71.212	Pharm. Prep.	3(3)	4	73.201	Physiol.	3(3)	
71.211	Pharm. Method.	3(3)	4	71.243	Ph. Juris.	4	4	73.241	Biochem.	4(3)	
73.200	Physiol.	3(3)	4	18.120	Micro.	3(3)	4	72.171	Anal. Chem.	3(3)	
39.115	Econ.	4	4		Elective	4	4		Elective	4	
	Elective	4	4								

## FOURTH YEAR

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
71.221	Phys. Pharm.	3(3)	4	71.222	Pharm. Tech.	3(3)	4
72.222	Drug. Anal.	3(3)	4	71.245	Ph. Admin.	4	4
73.221	P'cog.	3(3)	4	72.221	Med Chem.	3	3
	Elective	4	4		Elective	8	8

## FIFTH YEAR

QUARTER 10				QUARTER 10A				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.
71.246	Ph. Admin.	4	4	71.232	Pres. Pharm.	3(3)	4	71.233	Pres. Pharm.	3(3)	
72.231	Med. Chem.	4	4	71.247	Ph. Admin.	4	4	71.238	Ph. Admin or	3	
73.231	P'cology	3(3)	4	72.232	Med. Chem.	4	4	71.240	Instnl. Phar.	3	
73.245	Pathol.	4	4	73.232	P'cology	3(3)	4		or		
65.218	Pub. Health	3	3	73.237	P'cog.	3	3	71.242	Sp. Resch. Pr. or	3	
									Elective	3	
								71.241	Clin. Pharm.	3(3)	
								72.242	P'cology	4	
								90.251	Pl. Tech.	1	



## **Medical Technology**

### **Description**

The medical technologist helps the physician in the detection, diagnosis, and treatment of disease. The technologist is expected to work alone much of the time, performing complex clinical investigations with a minimum of supervision. Duties may include testing of blood for transfusions and for use of antibiotics, finding cancer cells in blood, preparing vaccines, and analyzing tissues and body fluid for inorganic as well as complex organic chemicals.

### **Program of Study**

Students enter the College as Health Professions majors in the Medical Technology Program. Cooperative work periods may be assigned during the sophomore, middler, and junior years. To qualify for entrance to an accredited Hospital School of Medical Technology a student must have an acceptable quality point average and must have completed the entrance requirements as outlined by the Board of Registry of Medical Technology of the American Society of Clinical Pathologists. During the junior and senior years, students will be assigned to an affiliated Hospital School of Medical Technology in the Greater Boston area where they will receive theoretical and practical instruction in medical microscopy, serology, hematology, bacteriology, mycology, parasitology, chemistry, blood banking, and histologic techniques. Academic credit will be given for medical technology education at the Hospital School. Students will register at the University for each of the quarters taken at the Hospital School.

### **Degree**

The degree granted will be the Bachelor of Science. The Hospital School of Medical Technology is approved by the Board of Schools of Medical Technology of the American Society of Clinical Pathologists and the Council of Medical Education of the American Medical Association. After satisfactory completion of the five-year program, candidates are eligible to write the Medical Technology Examination given by the Registry of Medical Technologists of the American Society of Clinical Pathologists.

## Specimen Program in Medical Technology

(Five-Year Cooperative)

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.
10.104	Fd. Math	4 4	10.105	Fd. Math	4 4		Elective	
	or			or			or	
10.150	Calc.	4 4	10.151	Calc.	4 4	10.152	Lin. Alg.	4
12.103	Gen. Chem.	4(3) 5	12.104	Gen. Chem.	4(3) 5	12.105	Anal. Chem.	4(6)
	or			or			or	
12.106	Gen. Chem.	4(3) 5	12.107	Gen. Chem.	4(3) 5	12.171	Anal. Chem.	3(3)
18.131	Gen. Bio.	3(4) 4	18.132	An. Bio.	3(4) 4	30.114	English	4
30.113	English	4 4		Mod. Lang.	4 4		Mod. Lang.	4
			18.106	M.T. Orie.	2 1	18.116	Clin. Path.	3(6)

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.141	Org. Chem. I	3(3) 4	12.142	Org. Chem. II	3(3) 4
18.140	Hematology	3(3) 4	18.120	Basic Micro	3(4) 4
10.106	Calculus	4 4		or	
	Elective	4 4	18.220	Gen. Micro	3(4) 4
	Mod. Lang.	4 4	10.107	Calculus	4 4
	or			or	
	Elective	4 4		Elective	4 4
				Mod. Lang.	4 4
				or	
				Elective	4 4

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.135	Gen. Dev. Biol.	3(4) 4	18.136	Cell Bio.	3(4) 4
11.117	Phys. Sci. Majors I	4 4	11.119	Phys. Sci. Majors II	4 4
	and			and	
11.124	Gen. Phys. Lab.	(3) 1	11.125	Gen. Phys. Lab. II	(3) 1
	or			or	
11.171	Bas. Phys. I	4 4	11.172	Bas. Phys. II	4 4
	and			and	
11.173	Bas. Phys. Lab. Elective	(3) 1 8	11.174	Bas. Phys. Lab. Elective	(3) 1 8

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.171	Anal. Chem.	3(3) 4		Biology Elect.	4
	or			Elective	4
12.161	Physical Chem.	3(3) 4		Elective	4
18.150	Comp. Vert. Anat.	3(6) 5	12.162	Physical Chem. (recommended)	3(3) 4
	or			or	
18.148	Human Anat. and/or Animal Histol. Electives	3(3) 4 8		Elective	4

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.133	Biology Elect.	4	18.134	Environ. & Population Biology	3(4) 4
	or			or	
	Biology Elect.	4		Biology Elect.	4
	Elective	4		Elective	12
12.163	Physical Chem. (recommended)	3(3) 4			
	or				
	Elective	4			

### **Medical Records Science**

The College of Pharmacy and Allied Health Professions will announce a full-time degree program for medical records librarians in the near future. Students interested in this area of study should make an appointment with the Dean of the College.

### **Dental Hygiene**

#### **Description**

An important member of the dental health team, the dental hygienist is licensed to render direct preventive services to the patient under the direction of the dentist. Services include administering dental prophylactic treatment, preparing dental radiographs, and teaching prescribed methods of maintaining dental health. Dental hygienists with advanced degrees are in increasing demand as clinical instructors and administrators of their programs.

#### **Program of Study**

The Forsyth School for Dental Hygienists conducts a program of dental hygiene education and general education in cooperation with Northeastern University. Students in this two-year program attend classes both at the Forsyth Dental Center and at Northeastern's immediately adjacent campus on Huntington Avenue.

#### **Degrees**

Graduates of the program will receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. Students who are interested in this program should make direct contact with the Forsyth School of Dental Hygiene. Students who complete the two-year program may apply their credits toward the degree of Bachelor of Science in University College at Northeastern.

## Forsyth School for Dental Hygienists

## First Year Curriculum

## FIRST YEAR

QUARTER 1				QUARTER 2				QUARTER 3			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.	
30.113	English	4	4	12.102	Chemistry	2(3)	3	30.114	English	4	
12.101	Chemistry	2(3)	3	18.141	Biology	3(4)	4	18.120	Microbiology	3(4)	
DH-01	Dental Anatomy	3	3	DH-02	Dental Anatomy	3	3	DH-60	Public Health I	2	
DH-70	Speech	2	2	DH-40	Nutrition	2	2	DH-28	Dental Materials	2(1)	
DH-20	Radiology	2	2	DH-05	Histology	3	3	DH-13	Dental Hygiene	2	
DH-11	Dental Hygiene	2	2	DH-12	Dental Hygiene	2	2	DH-13C	Clinical Dental Hygiene	(3)	
DH-11C	Clinical Dental Hygiene	(2)	1	DH-12C	Clinical Dental Hygiene	(2)	1				
		Total 17				Total 18				Total	

## SECOND YEAR

QUARTER 4				QUARTER 5				QUARTER 6			
No.	Course	Cl. Q.H.		No.	Course	Cl. Q.H.		No.	Course	Cl. Q.	
18.114	Anatomy and Physiology	4(3)	5	18.115	Anatomy and Physiology	4(3)	5	19.102	Psychology	4	
DH-61	Public Health II	3	3	DH-30	Pharmacology	2	2	21.100	Principles of Sociology	4	
DH-07	Pathology	3	3	DH-09	Oral Surgery	2	2	DH-03	Dental Anatomy	2	
DH-08	Periodontology	2	2	DH-15	Dental Hygiene	2	2	DH-16	Dental Hygiene	2	
DH-14	Dental Hygiene	2	2	DH-15C	Clinical Dental Hygiene	(15)	3	DH-16C	Clinical Dental Hygiene	(15)	
DH-14C	Clinical Dental Hygiene	(15)	3			Total 14				Total	
		Total 18									

( ) Lab Hours

DH Courses given by the Forsyth School.

### **Radiologic Technology**

The College of Pharmacy and Allied Health Professions will announce a full-time degree program for radiologic technologists in the near future. Students interested in this area of study should make an appointment with the Dean of the College.

### **Respiratory Therapy**

#### **Description**

Respiratory therapy, formerly known as inhalation therapy, is one of the most rapidly growing of the health professions. It is concerned with the diagnosis and treatment of acute and chronic lung disease occurring in patients of all ages, from newborn babies to senior citizens. Practitioners must be able to apply knowledge of basic sciences in order to use respirators, oxygen equipment, humidifying devices, and diagnostic tools with patients in various health care settings. Their responsibilities include providing direct minute-to-minute care to patients in continuous respirators, treating respiratory problems with intermittent therapy, teaching the patient with chronic disease to maintain his own care at home, working with outpatients, using special respiratory function equipment to aid in diagnosis, and maintaining sophisticated electronic and mechanical devices. Therapists are in demand in hospitals, extended care facilities, community health agencies, and research laboratories.

#### **Program of Study**

Mathematics and the physical, biological, medical, and health sciences provide the basis for the professional instruction in Respiratory Therapy. English, speech, psychology, and history provide the general educational background.

#### **Degree**

The Respiratory Therapy Program leads to the Associate in Science degree in three years on the Cooperative Plan. It allows candidates to take the examination of the American Registry of Inhalation Therapists and forms a basis for continuation of study on the Baccalaureate degree level.

Specimen Program in Respiratory Therapy  
Full-Time Students

FIRST YEAR

FALL QTR.					WINTER QTR.					SPRING QTR.				
No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.	No.	Course	Cl.	L.	Q.H.
18.114	Funct. Human Anat. I	4	3	5	18.115	Funct. Human Anat. II	4	3	5	18.120	Microbio.	3	4	
10.101	Mathematics	3		3	10.102	Mathematics	3		3	10.103	Mathematics	3		
86.591	Intro. to Resp. Therapy	2	2	3	86.592	Intro. to Resp. Ther. II	2	2	3	86.593	Resp. Therapy	2	2	
19.102	Intro. Psych.	4		4	30.101	English	4		4	86.502	Hospital Law	2		
										30.102	English	4		

SECOND YEAR

No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
86.594	Proc. Resp. Ther.	4	4	86.595	CLINICAL	4	4	86.596	Proc. Resp. Ther. II	4	
23.210	U.S. Hist. to 1865	4	4					23.211	U.S. Since 1865	4	
86.512	Med. Sci. I	3	3					86.513	Med. Sci. II	3	
29.100	Public Speaking	3	3					73.111	Drugs—Uses & Actions	4	

THIRD YEAR

No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.	No.	Course	Cl.	L. Q.H.
CO-OP				86.597	Proc. Resp. Therapy IV	4	4	86.598	Proc. Resp. Ther. V	4	
				86.511	Pers. & Comm. Health	2	2	86.524	Health Edu.	2	
				86.574	Hlth., Disease, & Dis. Electives	3	3	86.575	Hlth., Disease, & Disability Electives	3	

# courses of instruction

On the pages which follow are given in numerical order the synopses of courses offered in the several curricula of the Basic Colleges. All courses will be offered each year unless otherwise stated. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

Courses in the part-time evening programs in the College of Engineering are identical with those in the full-time day program.

A "quarter" hour equals approximately three clock hours of work: ordinarily one hour of class and two hours of preparation a week for a quarter of twelve weeks. Laboratory and drawing courses normally require fewer hours of outside preparation and, therefore, carry less credit than lecture courses.

**The University reserves the right to withdraw, modify, or add to the courses offered or to change the order of content of courses in any curriculum.**

## ABBREVIATIONS

Prereq.	Prerequisite
Cl.	Class Hours
Lab.	Laboratory Hours
Q.H.	Quarter Hours

## Course Numbering Program

The number to the left of the decimal point indicates the academic department offering the course. The three digits after the decimal point merely differentiate the courses within the department.

Accounting	41.	History	23.
Anthropology	20.	Industrial Engineering	05.
Art	27.	Italian	35.
Biology	18.	Journalism	38.
Business General	49.	Management	45.
Chemical Engineering	04.	Marketing	43.
Chemistry	12.	Mathematics	10.
Civil Engineering	01.	Mechanical Engineering	02.
Coop and Interdisciplinary	90.	Medicinal Chemistry	72.
Criminal Justice	92.	Military Science	91.
Drama and Speech	29.	Music	28.
Earth Sciences (Geology)	16.	Nursing	80.-84.
Economics	39.	Pharmacy & Pharm. Adm.	71.
Education — Foundation	50.	Pharmacology & Cognosy	73.
Education — Instruction	51.	Philosophy & Religion	26.
Education — Reading	54.	Phys. Ed.	60.-62.
Education — Speech and Hearing	55.	Physical Therapy	64.
Electrical Engineering	03.	Physics	11.
English	30.	Poly. Sci.	22.
Finance and Insurance	44.	Psychology	19.
French	31.	Recreation	63.
German	33.	Russian	34.
Graphic Science	09.	Sociology	21.
Health Education	65.	Spanish	32.
		Transportation	48.

## Civil Engineering

### 01.101 Special Topics (Prereq.—outstanding academic performance) 4 Q.H.

An individual effort in an area within the field of Civil Engineering selected by the student, and adviser with approval by the Department resulting in a definitive report. Work to be performed in both Quarters 10 and 11, equivalent to 2 Qtr. Hrs. each quarter. Final grade to be awarded in Quarter 11.

Staff

Fall, Winter, Spring Qtrs.

### 01.115 Engineering Measurements

3 Cl.; 3 Lab; 4 Q.H.

The methods and instruments utilized to perform engineering measurements; errors and reliability, propagation of errors in computing; application to problems of land surveying, route surveying, and topographical, hydrographical and construction surveys.

Profs. Domey, Meserve and Spencer

Fall and Summer Qtrs.

### 01.120 Fluid Mechanics I

(Prereq. 1.140) 4 Cl.; 4 Q.H.

Fluid properties; fluid statics; flow concepts including conservation of mass,



energy and momentum; closed conduct flow including friction; dimensional analysis; introduction to open channel flow.

Profs. Branagan, Horn and Stiefel

Spring and Summer Qtrs.

**01.122 Hydraulic Engineering**

(Prereq. 1.20) 4 Cl.; 4 Q.H.

Principles of hydrology, hydraulics of open channel flow, design of water distribution systems, design of sanitary sewer systems and storm drainage systems, hydraulic machinery.

Profs. Branagan, Horn and Stiefel

Fall and Winter Qtrs.

**01.134 Transportation Engineering**

(Prereq. 01.114) 4 Cl.; 4 Q.H.

The current technology and status of the various systems of transportation of people and materials, including highways, urban mass transit, railroads, air and water transport, conveyors and pipelines. Civil Engineering considerations of planning, design, cost, construction, research needs and environmental factors.

Prof. Ossenbruggen

Spring and Summer Qtrs.

**01.135 Construction Engineering**

(Prereq. 1.150) 4 Cl.; 4 Q.H.

Organizational concepts of construction entities; interrelationship of engineer, architect and contractor; cost management systems; planning and analysis of estimates; scheduling work utilizing computer methods; management and supervision of construction operations; quality control.

Prof. Spencer and Staff

Spring Qtr.

**01.140 Structural Mechanics I**

(Prereq.—Freshman Physics) 4 Cl.; 4 Q.H.

Statics of particles and rigid bodies in two and three dimensions. Analysis of internal forces in trusses and beams. Centroids and centers of gravity of lines, area and volumes. Moments of inertia of areas and masses. Shear and Moment diagrams.

Profs. Lenney, Namyet and Branagan

Winter and Spring Qtrs.

**01.141 Structural Mechanics II**

(Prereq. 1.140) 4 Cl.; 4 Q.H.

Stress and strain at a point. Mohr's circle of stress and strain. Mechanical properties of materials. Analysis of members subjected to torsion and axial loads. Analysis of beams in shear and bending; elastic and plastic theories. Buckling of columns. Theories of failure.

Profs. Lenney, Leet and Namyet

Fall and Winter Qtrs.

**01.143 Structural Analysis I**

(Prereq. 1.141) 4 Cl.; 4 Q.H.

Review of forces in beams and trusses. Influence lines for statically determinate structures. Deflections by Moment Area. Indeterminate structural analysis by slope-deflection and moment distribution.

Profs. Leet, Ossenbruggen and Spencer

Fall and Winter Qtrs.

**01.144 Structural Analysis II**

(Prereq. 1.143) 4 Cl.; 4 Q.H.

Deflections by Virtual Work. Indeterminate structural analysis by superposition, flexibility and stiffness. Influence lines for indeterminate structures.

Profs. Leet and Namyet

All Quarters

**01.145 Structural Analysis III**

(Prereq. 1.144) 4 Cl.; 4 Q.H.

Matrix methods of frame and truss analysis by flexibility and stiffness methods.

Profs. Leet and Namyet

Spring Qtr.

**01.150 Concrete Design I**

(Prereq. 1.141) 4 Cl.; 4 Q.H.

Design of reinforced concrete elements by the working stress and ultimate strength methods; bending members and short columns.

Profs. Pretzer and Khetarpal

Spring and Summer Qtrs.

**01.152 Concrete Design II**

(Prereq. 1.150) 4 Cl.; 4 Q.H.

Design of reinforced concrete structural systems including continuous beams, frames, floors and roofs. Prestressed concrete design theory and practice. Long columns of reinforced concrete.

Profs. Pretzer and Khetarpal

Fall and Winter Qtrs.

**01.160 Structural Design I**

(Prereq. 1.141) 4 Cl.; 4 Q.H.

Design of steel members subjected to tension, compression, bending and combinations of loading. Introduction to plastic analysis and design. Design of connections, braced frames, and rigid frames.

Profs. Cahoon and Namyet

Fall and Winter Qtrs.

**01.161 Structural Design II**

(Prereq. 1.160) 4 Cl.; 4 Q.H.

Design of steel plate girders, bridges, composite construction in bridges and buildings. Additional types in plastic analysis and design. Design for lateral loads on high-rise buildings.

Prof. Cahoon

Spring Qtr.

**01.172 Soil Mechanics**

(Prereq. 1.141) 3 Cl.; 3 Lab.; 4 Q.H.

Soil classification, soil-water phase relationships. Introduction to ground water seepage, consolidation theory, strength properties of soils, stress distributions in soils due to surface loads, lateral earth pressures, bearing capacity of shallow footings. Laboratory tests to identify soils, to determine physical properties and soil behavior.

Profs. Neff and Jaworski

Fall and Winter Qtrs.

**01.174 Foundation Engineering**

(Prereq. 1.172) 4 Cl.; 4 Q.H.

Evaluation of site survey and boring data for foundations. Determination of soil bearing capacity, design of spread footings, pile and caissons foundations. Design of retaining walls and braced sheeting. Selected topics on settlements and slope stability.

Profs. Jaworski and Neff

Spring Qtr.

**01.175 Engineering Geology**

(Prereq. 1.180) 4 Cl.; 4 Q.H.

Origin and composition of the earth's crust, identification of soil classes, engineering properties of soils, clay and rock mineralogy, geological mapping and exploration, earth movements, weathering, transportation of materials by wind and water.

Profs. Neff and Horn

Fall and Winter Qtrs.

- 01.180 Materials** (Prereq. Freshman Chemistry) 4 Cl.; 4 Q.H.  
 The fundamentals of the behavioral classification of materials, such as metals, polymers, colloids, glasses and composites. Other topics will include the significance of phase transformations, visco-elastic behavior and corrosion mechanisms.  
 Profs. Gregory and Pretzer Spring and Summer Qtrs.
- 01.182 Experimental Methods in Engineering Mechanics** (Prereq. 1.141) 1 Cl.; 4 Lab.; 4 Q.H.  
 Survey of experimental techniques and instrumentation, experimental determination of basic material properties for concrete, wood, metals and other engineering materials. Introduction to model analysis.  
 Prof. Leet, Mr. Alberti Spring and Summer Qtrs.
- 01.193 Environmental Engineering II** (Prereq. 1.122) 4 Cl.; 4 Q.H.  
 Water supply and wastewater disposal with particular emphasis on municipalities. Design of water and wastewater treatment facilities, including population growth, planning and financing. An overview of water resources serves to relate the design aspects to the general urban problem.  
 Profs. Blanc, Domey, Gregory, Horn and Meserve Spring and Summer Qtrs.
- 01.194 Environmental Engineering II** (Prereq. 1.193) 3 Cl.; 3 Lab.; 4 Q.H.  
 A series of projects and laboratory sessions designed to elaborate on the fundamentals of engineering design practice, including traditional design criteria and results of laboratory analysis.  
 Profs. Blanc, Domery, Gregory, Meserve and Stiefel Spring Qtr.
- 01.197 Survey of Environmental Problems** 4 Cl.; 4 Q.H.  
*Enrollment Limited to Non-engineers*  
 Major topics, water, wastewater, air pollution, and solid waste, will be covered in the following format: What and why the problem? Effects of this condition. Abatement procedures. The interrelationship of environmental conditions will be stressed and ecological considerations discussed.  
 Prof. Fillos All Quarters

## Mechanical Engineering

- 02.116 Dynamics** (Prereq. 01.140) 4 Cl.; 4 Q.H.  
 (Not open to M.E. Students)  
 Kinematics and kinetics of particles and rigid bodies, including work and energy.  
 Profs. Phalen and Yorra Fall and Winter Qtrs.
- 02.130 Thermodynamics I** 4 Cl.; 4 Q.H.  
 Thermodynamics is the study of the concepts of energy and energy interactions between material systems through the basic laws of thermodynamics. The concepts of energy are discussed, and the first law for the conservation of energy is set forth. A system is described, and its thermodynamic state is defined in terms of properties of substances. An energy analysis of various

thermodynamic systems are presented in terms of entropy and the second law. Some consequences of the second law are discussed.

Prof. Zelinski

All Quarters

### 02.131 Thermodynamics II

(Prereq. 02.130) 4 Cl.; 4 Q.H.

The general thermodynamic relationships between properties of a substance are developed. The equation of state is discussed for liquids, gases, and magnetic substances. The characteristics of power systems and refrigeration systems are presented. The thermodynamics of nonreacting mixtures of gases, liquids, and solids is set forth with the development of the chemical potential and phase relationships included. Reacting mixtures are studied, and the conditions for chemical equilibrium are outlined.

Prof. Foster

Fall and Winter Qtrs.

### 02.132 Introduction to Combustion

(Prereq. 02.130) 4 Cl.; 4 Q.H.

The basic knowledge necessary to understand combustion phenomena and its application to selected combustion problems. Fundamental principles of thermochemistry, kinetics of chemical reactions, and transport properties of gases are given. The conservation equations for reacting mixtures are discussed. Theories of the combustion of liquid droplets, laminar diffusion flames, and premixed laminar flames are presented.

Prof. Zelinski

Spring Qtr.

### 02.134 Direct Energy Conversion

(Prereq. 02.130) 4 Cl.; 4 Q.H.

Direct energy conversion is concerned with means for converting heat directly into electrical energy. Included among the devices which accomplish this are magnetohydrodynamic power generators, thermionic omission converters, and fuel cells. The operating principles of these engines are presented, and performance calculations are made. A unified theory of energy conversion is discussed based upon the concepts of irreversible thermodynamics.

Prof. Zelinski

Fall and Winter Qtrs.

### 02.145 Design Fundamentals

(Prereq. 02.167) 4 Cl.; 4 Q.H.

Engineering design analysis of dynamically loaded machine elements. Stress concentration, contact and impact stresses, thorough treatment of fatigue factors in design (combined loading and statistical considerations). Environmental factors in design, creep, temperature and atmospheric.

Profs. Mills and Sexton

Fall and Winter Qtrs.

### 02.146 Mechanical Engineering Design

(Prereq. 02.145) 4 Cl.; 4 Q.H.

Project, using system approach, which involves all aspects of mechanical engineering; mechanics, thermodynamics, heat transfer, etc. This course is intended to correlate previous courses in optimal design of various mechanical systems. Problem areas that will be investigated might include friction and power transmission devices, hydraulic systems, etc.

Profs. Blanchard, Mills, and Sexton

Spring and Summer Qtrs.

### 02.147 Engineering Design

(Prereq. 02.167) 4 Cl.; 4 Q.H.

Intended for students who take only one course in design. Topics covered are stress concentration, fatigue and impact loading, lubrication, friction, and power transmission devices and optimum design.

Prof. Sexton

Fall and Winter Qtrs.

- 02.148 Design and Analysis** (Open to all Seniors) 4 Cl.; 4 Q.H.  
To be an interdisciplinary course. Project either analytical or experimental supervised by an interdisciplinary faculty. Examples of projects (eg. trash disposal, underwater search and rescue).  
Prof. Blanchard Fall, Winter and Spring Qtrs.
- 02.149 Engineering Analysis** 4 Cl.; 4 Q.H.  
Equilibrium problems in systems with a finite number of degrees of freedom (i.e. as opposed to a continuous system), extremum techniques, methods of solving the resulting algebraic equations—examples of physical situations—equilibrium stresses in elastic structures, steady state temperature distribution, steady subsonic flow, electrostatic fields, and steady flow of direct and alternating current.  
Profs. Long and Rossettos Spring and Summer Qtrs.
- 02.150 Heat Transfer I** 4 Cl.; 4 Q.H.  
Modes of heat transfer; steady state and transient conduction, one and two dimensions; exact, numerical and graphical techniques; electrical analogy; natural and forced convection, laminar and turbulent; radiation; change of phase heat transfer; condensation and boiling; heat exchangers.  
Profs. Bowman and Otterman Fall and Winter Qtrs.
- 02.155 Fluid Mechanics I** (Prereq. 02.167) 4 Cl.; 4 Q.H.  
Differential and integral formulations of mass conservation and the equations of motion and energy; control volume applications; elements of one-dimensional, steady compressible flow; introductions to boundary layer theory; dimensional analysis and similitude.  
Profs. Nelson and Otterman Spring and Summer Qtrs.
- 02.156 Fluid Mechanics II** (Prereq. 02.155) 4 Cl.; 4 Q.H.  
Velocity potential and stream functions; circulation and Kelvin's theorem; two-dimensional, steady irrotational incompressible flow; Karman-Pohlhausen method applied to two-dimensional boundary layers.  
Profs. Nelson and Otterman Fall and Winter Qtrs.
- 02.157 Fluid Machinery** (Prereq. 02.155) 4 Cl.; 4 Q.H.  
General principles of Turbomachines; similitude and performance curves; specific speed; consideration of turbines, centrifugal pumps and impressors, axial pumps and compressors, regenerative pumps and turbines.  
Prof. Nelson Fall and Winter Qtrs.
- 02.165 Mechanics I** 4 Cl.; 4 Q.H.  
The concept and vector representation of force, moment of force, position, displacement, velocity, and acceleration. Equivalent force systems. System modeling; particles and rigid bodies; free body diagrams. Equilibrium; the kinematics and kinetics of particles.  
Profs. Dunn and Long Fall and Winter Qtrs.
- 02.166 Mechanics II** (Prereq. 02.165) 4 Cl.; 4 Q.H.  
Continuation of 02.165, Mechanics I. The kinematics and kinetics of rigid

bodies. Instantaneous equations of motion; work and energy; impulse and momentum.

Profs. Dunn and Long

Fall, Spring and Summer Qtrs.

### 02.167 Mechanics III

(Prereq. 02.165) 4 Cl.; 4 Q.H.

Stress and strain in a solid and their transformation properties; stress-strain relation for the linear elastic solid; yield criteria; determination of the stress and deformation of simple members under axial, torsional and flexural loadings.

Profs. Dunn and Long

Fall and Winter Qtrs.

### 02.168 Strength of Materials A

(Prereq. 02.167) 4 Cl.; 4 Q.H.

This course, dealing with the stress and deformation of slender members under flexural loadings, extends considerably beyond the simple shapes and loadings treated in 02.167. Stresses in symmetric members transmitting both shear and bending; bending of unsymmetrical beams; deflections due to bending by a variety of techniques; treatment of statically indeterminate problems; elastic stability of flexible columns.

Prof. Mills

Fall and Winter Qtrs.

### 02.169 Strength of Materials B

(Prereq. 02.167) 4 Cl.; 4 Q.H.

Applies the principles of the mechanics of elastic solids covered in 02.167 to a wide variety of situations of engineering interest. Energy methods; determination of the deformation and stress in curved members; pressure vessels, beams on elastic foundations, contact stresses; introduction to plastic analysis.

Prof. Mills

Spring and Summer Qtrs.

### 02.171 Mechanical Vibrations

(Prereq. 02.166) 3 Cl.; 2 Lab.; 4 Q.H.

One, two, and multi-degree of freedom systems using classical, energy, Laplace, mobility, matrix, and computer techniques.

Prof. Blanchard

Fall and Winter Qtrs.

### 02.172 System Analysis and Control

(Prereq. 02.166) 4 Cl.; 4 Q.H.

Theoretical background for analyzing and designing linear control system. System modeling, linear approximations and their limitations, transfer functions and block diagramming. Applications of the Laplace transform. Transient and frequency response. Stability, frequency domain and root locus techniques.

Profs. Blanchard and Dunn

Fall and Winter Qtrs.

### 02.173 Mechanics of Deformable Solids

(Prereq. 02.167) 4 Cl.; 4 Q.H.

Concept of stress tensor and elementary tensor manipulation, strain concept, the mathematical models of continuous elastic systems, methods of solution—the mathematical model, mathematical models of other deformable solids (ex. plastic, viscoelastic).

Profs. Long and Rossettos

Spring and Summer Qtrs.

### 02.174 Engineering Astrodynamics

(Prereq. 02.166) 4 Cl.; 4 Q.H.

Topics to be covered will include astronomical coordinate systems, gravitational and nongravitational forces on spacecraft, the motion of artificial

satellites, and observational techniques. The feasibility of voyages outside the solar system, interplanetary and interstellar navigation, and the hazards of space will be discussed.

Prof. Lautman

Spring Qtr.

**02.175 Analog and Digital Computer Techniques** 4 Cl.; 2 Lab.; 4 Q.H.

Analog and digital computers for both time and displacement based problems. Review of Boolean Algebra and Digital logic. Applications. Study of software for digital computers. Discussions about hybrid computers.

Prof. Blanchard

Spring Qtr.

**02.192 Measurement and Analysis** 2 Cl.; 3 Lab.; 4 Q.H.

Principles of engineering experimentation and instrumentation (including the thorough introduction to the analog computer) stressed in lectures and in proper design of experiments to minimize experimental error and uncertainty; tests on machines particularly suited to illustrate above and commensurate with students' academic background.

Prof. Sexton

Fall and Winter Qtrs.

**02.193 Mechanical Engineering Laboratory** (Prereq. 02.192) 6 Labs.; 4 Q.H.

Project type experiments. Students will choose, research, design, and manage experiments which are of particular interest to the group and which illustrate principles of thermodynamics, strength of materials, fluid mechanics, heat transfer, etc.

Prof. Sexton

All Quarters

**02.194 Mechanical Engineering Senior Project** (Prereq. 02.192) 4 Q.H.

A project may be of an analytical, design, or experimental nature. It must be approved by the faculty member under whom the student will work. A formal report must be submitted to the student's faculty supervisor at the end of the quarter.

Staff

All Quarters

**02.196 Materials Science** 4 Cl.; 3 Lab.; 5 Q.H.

Crystallography; structure of solids; imperfections in crystals; phase equilibrium basic mechanisms of metal strengthening and mechanical behavior; and the effect of temperature on the structure and properties of materials (recrystallization, recovery, precipitation, rate processes).

Profs. Nowak, Murphy, Zotos

Spring and Summer Qtrs.

**02.197 Mechanical Behavior of Materials** (Prereq. 02.196) 4 Cl.; 4 Q.H.

Elastic properties of materials, atomic basis for elastic constants; dislocation theory, plasticity of crystals and noncrystalline solids. Creep, fracture, fatigue.

Prof. Murphy

Fall and Winter Qtrs.

**02.198 Materials Processing** (Prereq. 02.196) 4 Cl.; 4 Q.H.

Casting, joining soldering, brazing, welding, mechanical forming and conventional and nonconventional machining. The topics will deal with metals and nonmetals alike.

Prof. Zotos

Spring Qtr.



- 02.199 Materials Science** (Not open to M.E. Students) 4 Cl.; 4 Q.H.  
Covers material in 02.196, but no laboratory work included.  
Profs. Nowak, Murphy, Zotos Spring and Summer Qtrs.
- 02.212 Advanced Mechanics of Materials** 4 Cl.; 4 Q.H.  
Review of fundamental stress concepts; points stress and strain; differential equations of stress; elastic properties; theories of failure; transverse bending; shear stress distribution; shear center; bending stresses due to nonsymmetrical bending.  
Thick and thin cylinders under elastic and plastic deformation; analysis of statistically indeterminate beams and frames by slope, deflection and moment distribution techniques; stresses in curved beams.  
Bending of flat plates; stability analysis of structural members; grid systems and other special topics to be selected by needs of the class.  
Prof. Phalen Fall and Winter Qtrs.
- 02.214 Experimental Stress Analysis** (Prereq. 02.167) 3 Cl.; 2 Lab.; 4 Q.H.  
Theory and application of mechanical and electrical strain gauges; installation, instrumentation and circuitry of gauge set-ups for transducer use and experimental stress analysis; use of brittle coatings; theory and practice of photoelastic methods as applied to models and coatings.  
Prof. Mills Fall and Winter Qtrs.
- 02.232 Physical Metallurgy** (Prereq. 02.196 or equivalent) 4 Cl.; 4 Q.H.  
Atomic structure and bonding; atomic basis for elasticity; anisotropic elastic behavior; anelastic behavior; equilibrium and non-equilibrium studies of one-, two-, and three-component systems; oxidation; corrosion; electrical and magnetic behavior.  
Profs. Murphy and Zotos Fall and Winter Qtrs.
- 02.233 Thermodynamics of Propulsion** (Prereq. 02.131) 4 Cl.; 4 Q.H.  
Application of the physical principles of thermodynamics, fluid mechanics and plasmas to the prediction of the behavior of propulsion devices. Air-breathing engines and rocket engines are discussed in detail with emphasis on realistic applications to demonstrate how physical laws both describe and limit the performance of particular devices. An introduction to plasmas is given. The fundamentals of electrical rocket propulsion are included.  
Prof. Zelinski Spring and Summer Qtrs.
- 02.235 Statistical Thermodynamics** 4 Cl.; 4 Q.H.  
Entropy and randomness—assemblies of independent particles; Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; monatomic and polyatomic gases; Einstein and Debye theories of the specific heat of solids; mixed gases; chemical and dissociative equilibrium.  
Prof. Nelson Spring Qtr.
- 02.236 Nuclear Engineering I** 3 Cl.; 2 Labs.; 4 Q.H.  
Study of Nuclear Physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fusion and fission. Health physics, nuclear instrumentation, and the production and uses of radioactive isotopes will be considered. A general comparison of thermal,



fast and broader reactor types will be made prior to a discussion of neutron interactions and slowing down. The four-factor formula and diffusion equation will be developed and applied to one group theory for bare and reflected thermal reactors. Energy production and distribution within the core and flux shaping will be discussed.

Profs. Bowman and Foster

Fall and Winter Qtrs.

### 02.237 Nuclear Engineering II

(Prereq. 02.236) 4 Cl.; 4 Q.H.

Development of two group theory for thermal reactors and consideration of the physics and safety of fast reactors. Effect of reactivity change, either intentional or accidental, as well as changes due to temperature, fission product buildup, xenon buildup after shutdown, and fuel depletion will be discussed. Reactor design considerations considering the interrelationship of reactor physics, reactor engineering control, distribution of power, fuel cycle management.

Profs. Bowman and Foster

Spring Qtr.

### 02.251 Heat and Mass Transfer

(Prereq. 02.150) 4 Cl.; 4 Q.H.

Review of heat, mass and momentum transfer analogies; rate equations; conduction problems in steady-state and transient-state for both heat and mass transfer with various constant and fluctuating boundary conditions in rectangular, cylindrical and spherical coordinates solved by formal mathematics, difference (relaxation) techniques and methods of analogy; thermal stresses induced by non-uniform temperature distributions; heat transfer at high velocity and in rarefied gases; boiling heat transfer at temperature extremes, with forced and natural convection; phase change in bulk stagnant systems.

Prof. Bowman

Spring and Summer Qtrs.

### 02.258 Gas Dynamics

(Prereq. 02.130) 4 Cl.; 4 Q.H.

Derivation of the conservation laws of fluid flow; wave motion and Mach number; adiabatic flow; calculation of propulsion forces; adiabatic flow with friction; normal shock analysis; analysis of compressible flow with heating or cooling; moving and oblique shock waves.

Prof. Otterman

Spring Qtr.

### 02.270 Analytical Dynamics

(Prereq. 02.166)

An intermediate course in engineering mechanics. Topics to be treated include central force motion, gyroscopic motion, dynamic stability, variational mechanics and the principal of least action. The Lagrangian equation of motion will be developed and applied to problems of the dynamics of particles and rigid bodies.

Profs. Yorra and Lautman

Spring and Summer Qtrs.

### 02.803 Continuum Mechanics

4 Cl.; 4 Q.H.

(Open to Undergraduates in Six-Year Program)

Algebra and calculus of Cartesian tensors, relation to vector analysis, curvilinear coordinates, stress in a continuum. Strain and strain rate in a continuum, governing equations for an elastic solid and a Newtonian Fluid. Some exact solutions.

Profs. Chu, Long, Nelson

Fall Qtr.

**02.862 Systems Engineering**

4 Cl.; 4 Q.H.

(Open to Undergraduates in Six-Year Program)

The modeling and analysis of physical systems. Vibration of mechanical systems with one degree of freedom including the free-body and energy methods of formulating the equations of motion. Free vibration of undamped multi-degree-of-freedom systems; influence coefficients; matrix notation and iteration. Mechanical network or mobility-diagram representations; block diagramming.

Profs. Blanchard and Dunn

Fall Quarter

## Electrical Engineering

**03.111 Circuits and Systems I**

(Prereq. 10.152) 4 Cl.; 4 Q.H.

Circuit elements (linear, nonlinear, time-invariant, and time-varying) sources (independent and controlled), Kirchhoff's laws, Tellegen's theorem, Thevenin's theorem, network topology, mesh and nodal analysis.

Prof. Kellner

Fall and Winter Qtrs.

**03.112 Circuits and Systems II**

(Prereq. 3.111) 4 Cl.; 4 Q.H.

Linearity and time-invariance, system function, forced and force-free response of networks and L.T.I. systems, singularity response, partial fraction expansion, "Pre-box" concept and signal flow graphs.

Prof. Kellner

Spring and Summer Qtrs.

**03.113 Circuits and Systems III**

(Prereq. 3.112) 4 Cl.; 4 Q.H.

Thevenin's theorem revisited, magnitude and phase plots, resonance, two-port networks, energy and power and convolution.

Prof. Martin

Fall and Winter Qtrs.

**03.122 Circuits and Systems IV**

(Prereq. 3.113) 4 Cl.; 4 Q.H.

Fourier analysis, Fourier series and transform, spectral analysis of AM-modulation, bilateral Laplace transform, unilateral Laplace transform and correlation.

Prof. Schetzen

Spring and Summer Qtrs.

**03.131 E.E. Laboratory I—Measurements**

(Prereq. 3.111) 1 Cl.; 3 Lab.; 2 Q.H.

Basic electrical measurements; report writing; use of standard laboratory instruments including digital voltmeters, oscilloscopes and bridges.

Prof. Martin

Spring and Summer Qtrs.

**03.132 E.E. Laboratory II—Circuits and Systems**

(Prereq. 3.112) 1 Cl.; 3 Lab.; 2 Q.H.

Experiments tied in the Circuits and Systems courses together with more work in measurements.

Prof. Martin

Fall and Winter Qtrs.

**03.133 E.E. Laboratory III—Devices**

(Prereq. 3.141) 1 Cl.; 3 Lab.; 2 Q.H.

Introduction to the analog computer; electro-optics; terminal characteristics of active devices.

Prof. Martin

Spring and Summer Qtrs.

**03.134 E.E. Laboratory IV**

(Prereq. 3.142, 03.161)

1 Cl.; 3 Lab.; 2 Q.H.

Analog computation; logic circuits; design and testing of active circuits; microwave studies; control systems.

Prof. Martin

Fall and Winter Qtrs.

**03.141 Electronics I**

(Prereq. 3.122) 4 Cl.; 4 Q.H.

Stresses the significance of linear active devices as related to the behavior of circuits and systems concerned with functions in the frequency domain. The concept of ideal amplification is modified to include the limitations imposed upon bandwidth and gain by the impedance levels, noise, parameter variation and distortion encountered in current active devices. Consideration is given to various types of coupling for cascaded stages with emphasis on the differential configuration as the heart of the generalized operational amplifier. The topic of feedback for single loop amplifiers emphasizes the concept of loop gains and their relation to gain, impedance levels, bandwidth and stability. Frequency selective amplifiers are considered on the basis of LC tuned circuits and RC active filters.

Profs. Cochrun and Grabel

Fall and Winter Qtrs.

**03.142 Electronics II**

(Prereq. 3.141) 4 Cl.; 4 Q.H.

Concerned with the use of active devices for functions other than those considered in Electronics I. The topic of frequency translation includes FM, AM, and PM systems. The topic modelling details and justifies the incremental models used in Electronics I and the d-c characteristics of active devices necessary to consider their use in time domain applications. Time domain applications include switching, gating, timing, synchronization, waveform shaping and generation and their use for such purposes as sweep circuits, logic and arithmetic operations.

Profs. Cochrun and Grabel

Spring and Summer Qtrs.

**03.161 Electromagnetic Field Theory I**

(Prereq. 10.156, 11.207) 4 Cl.; 4 Q.H.

Definition and representation of scalar and vector fields. Coordinate systems; elements of vector calculus; definition of the concepts of gradient, divergence, curl and the "del" operator; free space electrostatics; definition of the electric field intensity; the scalar potential; solution to Poisson and Laplace equations; macroscopic model of dielectric materials; the electric polarization and the electric flux density vector; boundary conditions; Lorentz force; free space magnetostatics; magnetic vector potential and solution to the "vector" Poisson equation; macroscopic model of magnetic materials; magnetization and magnetic field intensity; boundary conditions.

Prof. Schwab

Fall and Winter Qtrs.

**03.162 Electromagnetic Field Theory II**

(Prereq. 3.161) 4 Cl.; 4 Q.H.

Generalization of the Maxwell equations to the case of time varying fields; Faraday induction law; wave equations and the plane wave solution; Poynting theorem and the concept of energy stored by the fields; reflection and refraction of plane waves; time harmonic wave equations for the scalar and vector potentials; time harmonic form of retarded potentials; radiation from a dipole;

motion of charged particles in fields; magnetoionic media, elementary discussion of plasma physics and M.H.D.

Prof. Schwab

Spring and Summer Qtrs.

### 03.174 Basic Power Circuits

(Prereq. 3.112) 2 Cl.; 2 Q.H.

Balanced and unbalanced polyphase power circuits; harmonics; symmetrical components and application to the solution of fault conditions in power circuits.

Prof. Cleveland

Fall and Winter Qtrs.

### 03.175 Electromechanical Dynamics

(Prereq. 3.113, 3.162) 4 Cl.; 4 Q.H.

Review of Maxwell's equations and quasistatic approximations; electric and magnetic energy concepts; state variable formulation of electromechanical coupling. Applications to elementary energy conversion devices, singly and doubly-excited magnetic devices with mechanical translational and rotational elements. Generalized rotating electromagnetic energy convertors, circuit-model concepts, applications to selected extant rotating machines, i.e., commutator machines, a-c machines, dynamic response to various stimuli.

Prof. Cleveland

Fall and Winter Qtrs.

### 03.176 Machines and Systems

(Prereq. 3.174, 3.175) 4 Cl.; 4 Q.H.

A detailed investigation of the operating principles of synchronous machines; synchronous motor and generator power-angle characteristics; machine dynamics; machine and power system stability.

Prof. Cleveland

Spring Qtr.

### 03.183 Electrical Engineering I

(Prereq. 10.152) 4 Cl.; 4 Q.H.

Introductory course to electric circuit theory covering Kirchhoff's Laws; loop and nodal analysis; Thevenin's Theorem; power and energy; exponential excitation and the system function.

Not open to E.E. majors

Prof. Gabel

Fall and Winter Qtrs.

### 03.184 Electrical Engineering II

(Prereq. 3.183) 4 Cl.; 4 Q.H.

Properties and analysis of electronic devices, circuits and systems; elements of control systems; principles of energy conversion; emphasis on each topic determined according to major discipline.

Not open to E.E. majors

Prof. Gabel

Spring and Summer Qtrs.

### 03.191 Design and Organization of Digital Computers

(Prereq. or Coreq. 3.142) 4 Cl.; 4 Q.H.

Description of the basic components of a stored program digital computer. Topics covered include: number system and binary data representation, coding and flow charting, instruction formats and repertoires, arithmetic and logical computer operations; storage of data sets and data flow within a computing system, hybrid computation, organization and control of special purpose computers, memory types and hierarchies, man-machine communications, selected examples on computer applications.

Prof. Rabinovici

All Quarters

**03.215 Modern Circuit Theory**

(Prereq. 3.122) 4 Cl.; 4 Q.H.

Extends the students' knowledge in the area of network analysis as well as serving as an introduction to network synthesis. Some of the topics to be covered are: state variable formulation of network equilibrium equations, two-port network analysis, topological considerations in circuit equilibrium equations and an introduction to two-element kind network synthesis.

Prof. Kellner

Spring Qtr.

**03.218 Control System Theory**

(Prereq. 3.142) 4 Cl.; 4 Q.H.

Control system concepts; goals and basic components. Review of time and frequency domain techniques. Classical control system theory, error analysis for different type systems. Analyses of second and third order systems. Stability and relative stability using root locus and Nyquist diagrams. The Nichols chart. Compensation, application of computer technology to control systems analysis and design. State variable description of dynamic systems. The state equations and the fundamental analog realization of the standard equations. Solution of the state equations. Properties of the state transition matrix. Optimal systems. Introduction to sampled data systems. The Z-transform as an analog to the Laplace transform.

Prof. Loewenthal

Fall and Winter Qtrs.

**03.221 Electric Power Systems I**

(Prereq. 3.174) 4 Cl.; 4 Q.H.

This course with the succeeding course is designed to give a broad view of the structure of those electric systems whose primary function is energy transfer, and especially those whose function is the transfer of large quantities of energy. The functions of the various system elements are described and their significant characteristics are investigated briefly. The interrelation between elements is treated.

Prof. Cogbill

Fall and Winter Qtrs.

**03.222 Electric Power Systems II**

(Prereq. 3.221) 4 Cl.; 4 Q.H.

A continuation of Electric Power Systems I. Problems such as voltage control, protection, economics and planning which relate to the system as a whole are investigated. Taken with the previous course, it provides a general background for more intensive studies of electric power systems.

NOTE: A student may take both electives in sequence or may take the first course only.

Prof. Cogbill

Spring Qtr.

**03.233 E.E. Power Laboratory I**

(Prereq. 3.174) 1 Cl.; 3 Lab.; 2 Q.H.

Experimental work with polyphase power equipment, power measurements, polyphase power rectification, steady-state and dynamic operation modes of polyphase induction motors, power transformers and symmetrical component analysis of unbalanced loading of transformers, analog computer.

Prof. Cleveland

Fall and Winter Qtrs.

**03.234 E.E. Power Laboratory II** (Prereq. 3.175, 3.233) 1 Cl.; 3 Lab.; 2 Q.H.

Experimental work with rotating machinery and systems; steady-state and dynamic modes of operation of the commutator and synchronous machines;

system study involving synchronous machines; selected experiments in control systems; network analyzer studies.

Prof. Cleveland

Spring Qtr.

**03.237 Senior Project Laboratory I** (Prereq. 3.142, 3.162) 4 Cl.; 2 Q.H.

In this course students work with a faculty adviser on some term project, either experimental or theoretical.

Prof. Martin

**03.238 Senior Project Laboratory II** (Prereq. 3.142, 3.162) 4 Cl.; 2 Q.H.

This course may be a continuation of the project started in 03.237 or it may be a new project. Again the student works closely with a faculty adviser.

Prof. Martin

**03.241 Electronics Seminar** (Prereq. 3.142) 4 Cl.; 4 Q.H.

This course concerns: 1) the description and application of those electron devices (e.g., thyristers, photodiodes, etc.) not covered in depth in the regular Electronics Sequence; 2) electronic subsystems (e.g., AFC, shift registers, etc.); 3) systems (e.g., navigation systems, telephone switching, etc.). Most of the presentations are made by the students on topics of their choice, but there are also lectures by the instructor as well as by invited speakers, both from within and outside the department.

**03.242 Theory and Technology of Semiconductor Devices I**

(Prereq. 2.196) 3 Cl.; 3 Lab.; 4 Q.H.

This course comprises a closely coupled lecture and laboratory series. Topics covered include: technology and physics of the planar diffusion process; electronic properties of homogeneous semiconductors; inhomogeneities and junctions (Fermi potential diagrams, equilibrium at an abrupt discontinuity and the behavior of a junction under applied bias); the junction transistor.

Prof. Feldman

Fall and Winter Qtrs.

**03.243 Theory and Technology of Semiconductor Devices II**

(Prereq. 3.242) 3 Cl.; 3 Lab.; 4 Q.H.

This course is a continuation of 03.242. Material covered includes: introduction to unipolar transistor action; introduction to surface effects; the MOS-FET and a discussion of noise problems encountered in semiconductor devices.

Prof. Feldman

Spring Qtr.

**03.251 Communication Theory** (Prereq. 3.122) 4 Cl.; 4 Q.H.

Introduction to classical modulation theory, probability theory and some recent developments in communication theory. Topics include: signal space concepts, AM and FM, pulse modulation, matched filter, autocorrelation function, sampling theorem, probabilistic description of signals, source entropy and channel capacity.

Prof. Gonsalves

Spring Qtr.

**03.261 Wave Transmission and Reception**

(Prereq. 3.122, Coreq. 3.161) 4 Cl.; 4 Q.H.

Radiation, transmission, and reception of electromagnetic and acoustic

waves. Distributed circuits, antennas, microphones, loudspeakers, and sonar transducers.

Prof. Remillard

Fall and Winter Qtrs.

### **03.262 Advanced Topics in Electromagnetic Field Theory**

(Prereq. 3.162) 4 Cl.; 4 Q.H.

This course is a continuation of the required courses in field theory. Topics covered include (but are not limited to): microwave and waveguide structures; careful development of electromagnetic energy and force concepts and an introduction to radiation and antenna theory.

Prof. Schwab

Spring Qtr.

### **03.292 Mathematical Techniques in Electrical Engineering I**

(Prereq. 10.156 or equivalent) 4 Cl.; 4 Q.H.

Definition and representation of a complex variable and of functions of a complex variable. Topics covered include conformal mapping, singularities, Laurent series, residues and contour integration. Applications of complex variable theory to Fourier theory, Hilbert transforms, conformal transformations in the analysis of linear systems and in electrostatics.

Prof. Carrabes

Fall, Winter, and Spring Qtrs.

### **03.293 Mathematical Techniques in Electrical Engineering II**

(Prereq. 10.156 or equivalent) 4 Cl.; 4 Q.H.

Matrix notation and development of matrix algebra. The solubility of sets of linear equations; determinants, linear transformations, invariance, quadratic forms and eigenvalues. Illustrative applications of matrix techniques for the formulation and solution of problems drawn from the realm of circuit theory, probability theory and engineering physics.

Prof. Carrabes

Fall, Winter, and Spring Qtrs.

### **03.295 Numerical Methods and Computer Applications**

(Prereq. 3.191) 4 Cl.; 4 Q.H.

Presentation of some mathematical techniques used in solving scientific and engineering problems with the aid of computers. Topics covered include: theory of approximations and interpolations, iterative methods, numerical solutions of ordinary differential equations, accuracy determination, analog and digital simulation encountered in electrical engineering; use of programming, libraries of programs and subroutines. Representative problems will be chosen for solution by computer.

Prof. Rabinovici

Fall and Winter Qtrs.

### **03.296 Digital Techniques**

(Prereq. 3.142, 3.191) 4 Cl.; 4 Q.H.

Presents the characterization of devices, circuits and integrated structures encountered in digital systems; digital data transmission, error rates and system parameters, synchronous-asynchronous information processing techniques related to bulk and surface storage media. Digital system reliability, failure rates, redundancy techniques. Computer-aided design, testing of digital systems, timing considerations in digital systems.

Prof. Rabinovici

Spring Qtr.



## Chemical Engineering

### 4.101 Chemical Engineering Calculations I

(Prereq. 12.115) 3 Cl.; 3 Lab.; 4 Q.H.

Application of the fundamental laws of mass and energy conservation and equilibrium concepts to chemical and physical processes; economic considerations leading to optimal solutions. A computational laboratory is included to improve the facility of the student in handling sophisticated problems. Analog and numerical approaches are stressed where applicable.

Mr. Jackson

Fall and Winter Qtrs.

### 4.102 Chemical Engineering Calculations II

(Prereq. 4.101) 4 Cl.; 4 Q.H.

Simultaneous application of energy and mass conservation laws coupled with equilibrium considerations to comprehensive problems selected from the chemical processing industries; both steady and unsteady state processes.

Mr. Jackson

Spring and Summer Qtrs.

### 4.104 Commercial Chemical Development

(Prereq. 4.102, 12.115) 4 Cl.; 4 Q.H.

Designed to enable the student to make the transition from theoretical chemistry to the industrial process. Interrelationships between processes are studied from the standpoint of economics, raw materials, and apparatus. Problems requiring qualitative as well as quantitative reasoning.

Prof. Troupe

Not offered 1971-72

### 4.111 Chemical Engineering I

(Prereq. 4.102) 4 Cl.; 4 Q.H.

The important unit operations of Chemical Engineering. Fluid mechanics, heat transfer, and evaporation.

Prof. Stewart

Fall and Winter Qtrs.

### 4.112 Chemical Engineering II

(Prereq. 4.111) 4 Cl.; 4 Q.H.

A continuation of 4.111. Drying, distillation, absorption, and extraction.

Prof. Stewart

Spring and Summer Qtrs.

### 4.121 Transport Phenomena I

(Prereq. 4.112) 4 Cl.; 4 Q.H.

Chemical engineering from the transport phenomena standpoint. Introduction to fluid properties, derivations of the conservation equation for mass, momentum, and energy; solutions of differential equations in conduction; unsteady state heat transfer; and laminar fluid motion.

Prof. Williams

Fall and Winter Qtrs.

### 4.122 Transport Phenomena II

(Prereq. 4.121) 4 Cl.; 4 Q.H.

A continuation of 4.121. Convective heat transfer, turbulent fluid motion, mass transfer by molecular and eddy diffusion; mass transfer in laminar and turbulent motion; and simultaneous heat, mass, and momentum transfer.

Prof. Goodwin

Spring and Summer Qtrs.

### 4.123 Experimental Methods I

(Prereq. 4.112) 2 Cl.; 4 Lab.; 4 Q.H.

Experimental engineering methods; basic measurements, design of experimental apparatus, laboratory report writing, design of experiments, and data accuracy are stressed. Suitable experiments are performed.

Prof. Troupe

Fall and Winter Qtrs.



**4.124 Experimental Methods II**

(Prereq. 4.123) 2 Cl.; 4 Lab.; 4 Q.H.

A continuation of 4.123 with emphasis on the development of an experimental program, reduction of data, and presentation of results; use of computers in simulating experimental conditions, and for constructing mathematical models are stressed.

Prof. Troupe

Spring and Summer Qtrs.

**4.125 Material Science**

(Prereq. 4.126, 12.167) 4 Cl.; 4 Q.H.

The properties and applications of metals, plastics, and ceramics in general, with particular emphasis given to those materials problems which are encountered in the chemical engineering profession; modern theories of solid-state physics emphasizing the molecular and structural concepts upon which the physical properties of engineering materials depend; also, the classical thermodynamic theories dealing with solids.

To be announced

Not offered 1971-72

**4.126 Chemical Engineering Thermodynamics**

(Prereq. 4.102, 12.167) 4 Cl.; 4 Q.H.

The first law and its application to batch and flow systems; heat effects in chemical and physical processes; thermodynamic properties; the second law; entropy; physical and chemical equilibria; emphasis on the fundamental principles and mathematical relationships and their application to the analysis and solution of a variety of engineering problems.

Prof. Goodwin

Fall and Winter Qtrs.

**4.131 Process Design**

(Prereq. 4.122, 4.126) 1 Cl.; 6 Lab.; 6 Q.H.

The class participates in the process design of a chemical plant capable of producing a specified annual tonnage of a chemical when specific raw materials are available. The fundamentals of chemical engineering science, practice, analysis, and economics which have been studied in previous courses are used to prepare a report containing flow sheets, material and energy balances, designs of processing units, and cost estimates of the capital requirements for procuring, erecting, and operating the plant.

Prof. Prodaný

Fall and Winter Qtrs.

**4.132 Process Design**

(Prereq. 4.131) 1 Cl.; 6 Lab.; 6 Q.H.

Each student or a small group of students designs a chemical plant to produce a specified annual tonnage of one or more chemicals with a specific feed stock. The techniques used in Process Design I are used by each student to prepare an individual process design report and cost estimate for the particular plant assigned.

Prof. Prodaný

Spring Qtr.

**4.133 Projects**

(Prereq. Senior student and consent of Dept.) 1 Cl.; 6 Lab.; 6 Q.H.

Individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proved ability. Research topic selected by mutual agreement of the student and his supervising professor.

Prof. Troupe and Staff

Fall and Winter Qtrs.

- 4.134 Projects** (Prereq. 4.133) 1 Cl.; 6 Lab.; 6 Q.H.  
A continuation of the research work undertaken in 4.133.  
Prof. Troupe and Staff Spring Qtr.
- 4.135 Introduction to Nuclear Engineering** (Prereq. 10.156; 11.206) 4 Cl.; 4 Q.H.  
Review of nuclear physics; nuclear fission, the nuclear chain reaction; reactor theory, radiation shielding; materials of construction; reactor instrumentation and control; separation of stable isotopes; chemical separation; processing and special techniques of nuclear engineering.  
Prof. Buonopane 1971-72 Fall and Winter Qtrs.
- 4.136 Chemical Engineering Kinetics** (Prereq. 12.167, 4.126) 4 Cl.; 4 Q.H.  
Fundamental theories of a rate of chemical change including collision and transition state theory in homogeneous reacting systems; integral and differential analysis of kinetic data and a design of batch and continuous flow chemical reactors; catalysis theory and design of catalytic reactors.  
Prof. Goodwin Spring and Summer Qtrs.
- 4.137 Applied Mathematics in Chemical Engineering** (Prereq. 10.155) 4 Cl.; 4 Q.H.  
Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, partial differential equations, and numerical solution techniques. Emphasis will be placed primarily on methods for formulating these problems.  
Prof. Goodwin 1971-72 Spring Qtr.
- 4.138 Chemical Process Control** (Prereq. 10.155) 4 Cl.; 4 Q.H.  
Introduction to the principles of automatic control systems. Emphasis on modeling and design of feed-back control systems for temperature, liquid level, and flow control applications.  
Prof. Stewart 1971-72 Fall and Winter Qtrs.
- 4.141 Junior Honors Program** (Prereq. Approval of Dept.) To be assigned.  
Those students undertaking a Junior Honors Program may petition for two credits for the research problem undertaken.  
Prof. Troupe All Quarters
- 4.142 Introduction to Optimization** (Prereq. 10.155) 4 Cl.; 4 Q.H.  
Elementary optimization techniques are applied to problems encountered in the chemical processing industry. These techniques include gradient search, pattern search, linear and dynamic programming. A knowledge of differential calculus is required.  
Prof. Williams Spring Qtr.
- 4.143 Special Topics** (Prereq. Senior Standing) 4 Cl.; 4 Q.H.  
Chemical engineering topics of interest to the staff member conducting the class are presented for study.  
Prof. Troupe and Staff Spring Qtr.

**4.146 Introduction to Nuclear Engineering (E.E.)**

(Prereq. 10.156, 11.207) 4 Cl.; 4 Q.H.

Course for Electrical Engineering Power Systems students. Introduction to nuclear engineering; fundamental concepts of nuclear power; nuclear reactors and power plants; radiation protection and safety. Supplementary laboratory experiments.

Prof. Buonopane

Spring Qtr.

## Industrial Engineering

**5.128 Work Design**

3 Cl.; 3 Lab.; 4 Q.H.

Philosophy and principles of work design, use of graphic models such as process charts, operation charts, man-machine charts, etc. Work measurement techniques including stop watch, synthetic standard and work sampling. Extensive use of projects.

Prof. Hulbert

Spring and Summer Qtrs.

**5.129 Manufacturing Processes and Value Analysis**

3 Cl.; 2 Lab.; 4 Q.H.

Principles and techniques in processes for the manufacture of articles of commerce, emphasis on process design and cost, consideration of process control and automation; metal working, forming, machining, and bonding; job-shop tooling and techniques; plastics and rubber forming and extruding; textiles, paper, electronics, food processing, and other manufacturing operations. Principles and procedures to obtain optimum value in products, complete value analysis study; methods of revealing excessive costs; concepts of government contracts; relationship of value analysis to design, manufacturing, procurement, and installation. Emphasis on values added resulting from choice of manufacturing process.

Prof. Hulbert

Spring and Summer Qtrs.

**5.130 Systems I**

(Prereq. 10.146) 4 Cl.; 4 Q.H.

Linear feedback systems and solutions for steady state in first order systems. Integral and derivative control. LaPlace transforms for continuous systems analysis and Z-transforms in discrete systems. Transfer functions.

Prof. Freeman

Fall and Winter Qtrs.

**5.131 Systems II**

4 Cl.; 4 Q.H.

Continuation of Systems I with emphasis on applications; Inventory systems, distribution systems, information systems; introduction to simulation of large systems with analog and digital computers.

Prof. Freeman

Spring Qtr.

**5.147 Statistics I**

(Prereq. 10.208) 4 Cl.; 4 Q.H.

What is a statistic, distributions of random variables including normal, t, chi-square, F, poisson, binomial; estimation of parameters-point estimation by method of moments, maximum likelihood, Bayes estimates.

Prof. Hall

Spring and Summer Qtrs.

**5.148 Statistics II**

(Prereq. 5.147) 4 Cl.; 4 Q.H.

Interval estimation; stating and testing hypothesis; Linear Regression; An-

alysis of variance; applied topics such as reliability, quality control, decision theory from Bayes Rule.

Prof. Hall

Fall and Winter Qtrs.

**5.149 Reliability and Quality Control** (Prereq. 5.148) 3 Cl.; 3 Lab.; 4 Q.H.

Applied probability and statistical inference techniques are utilized in reliability analysis and quality control. Both theory and application are discussed in relation to the total quality assurance program.

Prof. Hoover

Spring and Summer Qtrs.

**5.161 Operations Research I**

4 Cl.; 4 Q.H.

Deterministic models including L.P. and duality; transportation and allocation; sensitivity and post optimality analysis; network analysis including maximal flow, shortest route, and PERT; dynamic programming and recursive functional expressions; game theory.

Prof. Freeman

Fall and Winter Qtrs.

**5.163 Operations Research II**

(Prereq. 10.208) 4 Cl.; 4 Q.H.

Stochastic models in O.R., their analytical development and solution. Topics covered: Queuing models, deterministic and stochastic inventory models, Markov Chains, sequencing.

Prof. Freeman

Spring and Summer Qtrs.

**5.165 Production and Inventory Control**

4 Cl.; 4 Q.H.

Study of both deterministic inventory models and models with stochastic demand and/or lead time. Single period and multiple period models to be developed. Emphasis on cost structure and determination of optimum policies. Relationship to workload planning, scheduling, and dispatching.

Prof. Freeman

Fall and Winter Qtrs.

**5.166 Facilities Planning and Design**

3 Cl.; 3 Lab.; 4 Q.H.

Application of quantitative techniques such as Queuing theory and engineering economy to problems involving facilities planning and materials handling; basic graphical tools; models for plant layout; laboratory projects.

Prof. Moore

Fall and Winter Qtrs.

**5.169 Advanced Topics in Operations Research** (Prereq. 5.163) 4 Cl.; 4 Q.H.

Topics to include duality Kuhn-Tucher conditions, Lagrangian techniques, static and dynamic stochastic decision processes, model formulation and analysis.

Prof. Freeman

Spring Qtr.

**5.186 Personnel and Organizations**

4 Cl.; 4 Q.H.

The individual in the industrial environment; work theory, motivation, interpersonal relations; consideration of modern personnel practice based on the concepts of the behavioral sciences; structure and dynamics of industrial organizations; problems of innovation; case studies for situational analysis.

Prof. Fisher

Fall and Winter Qtrs.

**5.187 Industrial Relations**

4 Cl.; 4 Q.H.

Analysis of industrial relations and organized labor with emphasis on the historical developments leading to their current status; union organization

and philosophy; interaction of management, government and labor; collective bargaining; the engineer's role in industrial relations.

Prof. Fisher

Spring Qtr.

#### **5.240 Digital Simulation Techniques**

4 Cl.; 4 Q.H.

Design of simulation experiments, construction of the computer model, pseudo-random number generation, simulation logic and flow charting, testing and validation of models, applications drawn from physical sciences, engineering, business, industry, medicine, government, and the social sciences.

Prof. Moore

Fall and Winter Qtrs.

#### **5.241 Management Information Systems**

4 Cl.; 4 Q.H.

Determination of what type of information management requires for reasonable decision-making and how it should be collected, stored, summarized, and reported for maximum utilization on the part of the industrial firm.

Mr. Clark

Fall and Winter Qtrs.

#### **5.245 Basic Engineering Statistics**

4 Cl.; 4 Q.H.

Introduction to basic probability distributions, including the binomial and hypergeometric, exponential, poisson and normal; laboratory data analysis; statistical test of hypotheses about central tendency and variability; curve fitting with least squares on engineering data.

Prof. Hall

All Quarters

#### **5.260 Engineering Economy**

4 Cl.; 4 Q.H.

The formulation of analytical techniques such as rate of return, present worth, annual cost. The application of these techniques to reach economical solutions to business and engineering problems involving design, reelection, replacement, lease-buy-decisions, and decisions between multiple alternatives. Sensitivity analysis and basic probability are introduced in cases where uncertainty exists. Brief survey of sources and costs of capital, debt-versus-equity-financing and leverage.

Prof. Hall

All Quarters

#### **5.267 Special Topics in Engineering**

(Prereq. 5.260) 4 Cl.; 4 Q.H.

Analysis of the capital structure of the firms, the cost of various security types and the total cost of capital, case studies of engineering problems involving retirement-replacement decisions, lease-buy decisions and capital expenditure decisions, considering the impact of income taxes, inflation and leverage, analysis of accounting data for managerial decisions, introduction to Bayesian statistics and utility theory and their application to engineering problems involving uncertainty.

Spring and Summer Qtrs.

#### **5.290 Independent Study in Industrial Engineering**

1—4 Cl.; 1—4 Q.H.

For students usually in the senior year with high scholastic standing on advanced I.E. topics. Projects may be of an applied or theoretical nature; formal report submitted to student's project supervisor at the end of quarter.

Adviser

All Quarters

## Graphic Science

- 9.105 Computer Programming** 1 Cl.; 1 Q.H.  
 A special course offered primarily for Engineering transfer students. This course covers basic programming methods using the FORTRAN language. Emphasis is on general programming, but example problems are chosen from the various branches of Engineering.  
 Prof. Rule Fall Qtr.
- 9.106 Basic Engineering** 4 Cl.; 4 Q.H.  
 Basic engineering and design concepts. Analysis and review of a variety of case studies noting how scientific principles are applied to the solution of engineering problems. Engineering drawings; introduction to computer programming.  
 Prof. Rule and Staff Fall and Winter Qtrs.
- 9.107 Basic Engineering** (Prereq. 9.106) 4 Cl.; 4 Q.H.  
 Creative design and conceptual solutions to engineering problems. Involvement in original design problems; application of the design process. Computers as an aid to the designer; computer graphics; numerical methods.  
 Prof. Rule and Staff Spring and Summer Qtrs.
- 9.111 Introduction to Digital Computation** 1 Cl.; 0 Q.H.  
 Demonstrates the methods and techniques of programming digital computers. Emphasis is on general programming principles which are applicable to the full spectrum of electronic digital computers. The student is taught a typical computer language called FORTRAN and is shown the capabilities of this language through the use of case studies. These case studies show the application of digital methods in the solution of scientific, and engineering-oriented problems.  
 Prof. Rule Fall Qtr.
- 9.112 Advanced Programming Principles** 1 Cl.; 0 Q.H.  
 Higher-level capabilities of the computer are developed by introducing more sophisticated aspects of the FORTRAN language. Computer logic and iterative procedures are emphasized through case studies that introduce the student to numerical methods.  
 Prof. Rule Winter Qtr.
- 9.113 Engineering Applications and Numerical Methods** 1 Cl.; 1 Q.H.  
 The more prominent numerical methods and mathematics associated with digital computation are explored and applied to solve engineering problems. Professionally written programs are reviewed as case studies to demonstrate advanced techniques. Programs available as library subprograms (Scientific Programming Package) are reviewed.  
 Prof. Rule Spring Qtr.
- 9.114 Introduction to Computers** 2 Cl.; 2 Q.H.  
 A special course covering basic programming methods using the Fortran language. Some numerical methods are covered, but emphasis is on writing programs to solve simple engineering-based problems.  
 Prof. Rule Fall and Winter Qtrs.

**9.115 Computer Programming**

(Prereq. 9.114) 2 Cl.; 2 Q.H.

Higher-level programming techniques are developed including writing of sub-programs and making use of scientific subroutine packages. Graphical output using the CalComp plotter is covered.

Prof. Rule

Winter and Spring Qtrs.

## Mathematics

**10.101 Basic Mathematics**

3 Cl.; 3 Q.H.

Development of real numbers and the algebraic operations with emphasis placed on the field postulates. Study of polynomials, fractions, exponents, radical expressions, 1st and 2nd degree equations, solutions of inequalities, relations and functions.

Prof. Claflin

Fall Qtr.

**10.102 Basic Mathematics**

(Prereq. 10.101) 3 Cl.; 3 Q.H.

Continuation of functions and relations, graphs, simple forms of conic sections, variation, exponential and logarithmic functions, systems of equations and inequalities, complex numbers.

Prof. Claflin

Winter Qtr.

**10.103 Basic Mathematics**

(Prereq. 10.102) 3 Cl.; 3 Q.H.

Theory of equations, sequences and series, probability, topics in trigonometry.

Prof. Claflin

Spring Qtr.

**10.104 Fundamentals of Mathematics**

(Prereq. 1 unit high school algebra) 4 Cl.; 4 Q.H.

Numerical systems; review of algebraic processes; solutions of linear and quadratic equations and inequalities; elementary matrix operations with applications; permutations, combinations, and probability.

Prof. McCallister

Fall and Winter Qtrs.

**10.105 Fundamentals of Mathematics**

(Prereq. 10.104 or equivalent) 4 Cl.; 4 Q.H.

Selected topics in analytic geometry; number sequences; limits and continuity of functions; geometric interpretation of a derivative; derivatives by formula; applications of derivatives to curve sketching and problem solving.

Prof. McCallister

Spring and Summer Qtrs.

**10.106 Calculus**

(Prereq. 3½ units of coll. prep. math. or 10.103, 10.105, or 10.123)

4 Cl.; 4 Q.H.

A first course for upper-class students. Differential calculus of one variable; topics in analytic geometry.

Prof. Klein

Fall and Winter Qtrs.

**10.107 Calculus**

(Prereq. 10.106) 4 Cl.; 4 Q.H.

Integral calculus of one variable with an introduction to differential equations.

Prof. Klein

Spring and Summer Qtrs.



- 10.111 Calculus** (Prereq. 3½ units coll. prep. math.) 3 Cl.; 3 Q.H.  
A first course in calculus for freshmen majoring in biological sciences and Pharmacy. Limits, particularly the derivative; topics in analytic geometry related to the application of the derivative.  
Prof. Blackett Fall Qtr.
- 10.112 Calculus** (Prereq. 10.111) 3 Cl.; 3 Q.H.  
Differentiation and integration of functions, with applications; topics in analytic geometry, including calculations of areas of plane figures bounded by algebraic curves. Further techniques of evaluation of limits.  
Prof. Blackett Winter Qtr.
- 10.113 Calculus** (Prereq. 10.112) 3 Cl.; 3 Q.H.  
Transcendental functions and their derivatives and integrals; parametric functions; applications of definite integrals and other limits.  
Prof. Blackett Spring Qtr.
- 10.146 Mathematical Analysis** (Prereq. 10.145) 3 Cl.; 3 Q.H.  
Introduction to numerical methods for engineering problems, employing the digital computer in root-evaluation, interpolation, and integration. Ordinary differential equations, including solution of first order equations and linear equations with constant coefficients.  
Prof. Filgo Fall and Winter Qtrs.
- 10.147 Mathematical Analysis** (Prereq. 10.146) 3 Cl.; 3 Q.H.  
Ordinary differential equations, including numerical and series solutions; Fourier series; introduction to partial differential equations and boundary-value problems.  
Prof. Filgo Spring and Summer Qtrs.
- 10.150 Calculus** 4 Cl.; 4 Q.H.  
A course in calculus for freshmen in the College of Engineering. Differential calculus of algebraic functions and its application.  
Prof. Cook Fall and Winter Qtrs.
- 10.151 Calculus** (Prereq. 10.150) 4 Cl.; 4 Q.H.  
Differential and integral calculus of trigonometric, exponential and logarithmic functions with applications.  
Prof. Cook Winter and Spring Qtrs.
- 10.152 Linear Algebra** (Prereq. 10.151) 4 Cl.; 4 Q.H.  
Study of linear vector spaces in 2, 3, and  $n$ -dimensions. Matrices and their properties. Solution of systems of linear equations.  
Prof. Epstein Spring Qtr.
- 10.153 Calculus** (Prereq. 10.151) 4 Cl.; 4 Q.H.  
Solid analytic geometry, vectors, infinite series, partial derivatives, with applications.  
Prof. Dunlap Fall and Winter Qtrs.



- 10.154 Calculus** (Prereq. 10.153) 4 Cl.; 4 Q.H.  
Multiple integration, complex variables, with applications.  
Prof. Dunlap Spring and Summer Qtrs.
- 10.170 Geometry** (Prereq. a course in calculus) 4 Cl.; 4 Q.H.  
Selected topics from advanced plane geometry in Euclidean style, such as collinear points, concurrent lines, duality, cross-ratio, harmonic division of segments, homogeneous coordinates, abridged notations, special theorems concerning points, lines, triangles, and circles (Euler, Desargues, Lemoine, Brocard, Brianchon, Feuerbach); the nine point circle, inversion, reciprocation.  
Prof. Dean Fall and Winter Qtrs.
- 10.171 Geometry** (Prereq. 10.170) 4 Cl.; 4 Q.H.  
Discussion of Euclid's definitions and postulates; examination in detail of the fifth postulate and other items leading to non-Euclidean geometry. Some special topics in non-Euclidean geometry of the hyperbolic and elliptic planes.  
Prof. Dean Spring and Summer Qtrs.
- 10.181 Calculus I**  
Derivatives and integrals of functions of one variable. Approximation methods including Taylor series and power series. Brief introduction to differential equations, partial derivatives, and multiple integrals.
- 10.182 Calculus II**  
Continuation of 10.181.
- 10.183 Calculus III**  
Continuation of 10.182.
- 10.184 Calculus and Linear Methods I** (Prereq. 10.183) 4 Cl.; 4 Q.H.  
The basic knowledge of real vectors and linear maps needed for higher dimensional calculus. Differential calculus of maps from  $m$ -space to  $n$ -space. Parametrized lines, surfaces, etc. Integration on these objects. Various forms of Stokes' Theorem.
- 10.185 Calculus and Linear Methods II** (Prereq. 10.184) 4 Cl.; 4 Q.H.  
Continuation of 10.184.
- 10.186 Calculus and Linear Methods III** (Prereq. 10.183—Coreq. 10.184) 4 Cl.; 4 Q.H.  
A more thorough introduction to vector spaces, particularly function spaces and linear operators, motivated by a study of linear differential equations and Fourier series. Separation of variables in partial differential equations. A survey of some standard problems in Physics which use differential equations. Eigenvalues. Special functions.  
NOTE: 10.186 and 10.187 may be taken parallel with 10.184 and 10.185.

**10.187 Calculus and Linear Methods IV**

(Prereq. 10.186—Coreq. 10.185) 4 Cl.; 4 Q.H.

Continuation of 10.186.

**10.195 Honors Calculus**

(Prereq. Advanced Placement) 5 Cl.; 5 Q.H.

An accelerated course in the calculus of functions of one variable.

Prof. Sorani

Fall Qtr.

**10.206 Algebra**

(Prereq. 10.203) 4 Cl.; 4 Q.H.

Set theory and logic; laws of composition; algebraic structures. Monoids, groups, rings, fields, quotient groups.

Prof. Bridger

Fall and Winter Qtrs.

**10.207 Differential Equations**

(Prereq. 10.204) 4 Cl.; 4 Q.H.

Solution of elementary ordinary differential equations; first order equations; higher order linear equations; series solutions.

Prof. Epstein

Spring and Summer Qtrs.

**10.208 Probability**

(Prereq. 10.204) 4 Cl.; 4 Q.H.

Probability functions for finite and infinite sample spaces; conditional probability and independence; discrete and continuous probability distributions for one or more random variables; expectation; moments; moment-generating functions; central limit theorem.

Prof. Stubbs

Fall and Winter Qtrs.

**10.211 Fortran and Forgo I**

1 Cl.; 1 Q.H.

Introduction to computer programming via FORGO language. Development of simple mathematical models and their solution by computers. Elementary numerical methods, flow charting.

**10.212 Fortran and Forgo II**

(Prereq. 10.211) 1 Cl.; 1 Q.H.

Continuation of 10.211.

**10.213 Fortran and Forgo III**

(Prereq. 10.212) 1 Cl.; 1 Q.H.

Continuation of 10.212.

**10.214 Systems Programming**

(Consent of Instructor) 4 Cl.; 4 Q.H.

**10.220 Mathematical Statistics**

(Prereq. 10.208) 4 Cl.; 4 Q.H.

Estimation of parameters; confidence intervals; hypothesis testing; regression; sampling distributions; introduction to analysis of variance and statistical decision theory.

Prof. Stubbs

Spring and Summer Qtrs.

**10.221 Applied Analysis**

(Prereq. 10.203, 10.207, 10.252) 4 Cl.; 4 Q.H.

Review of elementary linear algebra; functions of a matrix; bilinear and quadratic forms; spectral theory; applications include systems of first order linear differential equations.

Prof. Epstein

Fall and Winter Qtrs.

- 10.222 Applied Analysis** (Prereq. 10.221) 4 Cl.; 4 Q.H.  
 Series expansions; function spaces; integral equations; study of the partial differential equations associated with wave propagation, heat, and diffusion.  
 Prof. Epstein Spring and Summer Qtrs.
- 10.223 Numerical Analysis** (Prereq. 10.203, 10.252, 10.220) 4 Cl.; 4 Q.H.  
 Solution of nonlinear equations and systems of linear and nonlinear equations; approximation; interpolation; smoothing; numerical integration and differentiation.  
 Prof. Klein Fall and Winter Qtrs.
- 10.224 Numerical Analysis** (Prereq. 10.223) 4 Cl.; 4 Q.H.  
 Numerical solution of ordinary differential equations; accuracy and stability; numerical solution of boundary value and initial value problems in partial differential equations and integral equations.  
 Prof. Klein Spring and Summer Qtrs.
- 10.226 Functions of a Complex Variable** (Prereq. 10.251) 4 Cl.; 4 Q.H.  
 Complex analytic functions; elementary functions and mappings; contour integrals; series representation.  
 Prof. Filgo Fall and Winter Qtrs.
- 10.230 Linear Programming and Game Theory**  
 (Prereq. 1 year college math.) 4 Cl.; 4 Q.H.  
 Introduction to linear programming, game theory, and linear economic models.  
 Prof. Klein Spring and Summer Qtrs.
- 10.232 Multivariate Statistics** (Prereq. 10.220) 4 Cl.; 4 Q.H.  
 Methods of classification, estimation, and prediction based on several statistical variables.
- 10.251 Analysis** (Prereq. 10.203, 10.205) 4 Cl.; 4 Q.H.  
 Real numbers and elementary topology of  $\mathbb{R}^n$ . Continuity, properties of continuous functions, uniform continuity. Sequences of functions, uniform convergence.  
 Prof. Hajian Fall and Winter Qtrs.
- 10.252 Analysis** (Prereq. 10.251) 4 Cl.; 4 Q.H.  
 Riemann integration, differentiability. Contraction mapping principle, inverse and implicit function theorems.  
 Prof. Hajian Spring Qtr.
- 10.253 Analysis** (Prereq. 10.252) 4 Cl.; 4 Q.H.  
 Multilinear algebra and forms. Poincaré's lemma, generalized Stokes theorem.  
 Prof. Frampton Fall and Winter Qtrs.
- 10.254 Algebra** (Prereq. 10.206 or equiv.) 4 Cl.; 4 Q.H.  
 Theory of rings: unique factorization for integers, polynomials, and other

systems. Theory of groups: action orbits, quotient spaces, index formulas, isomorphism theorem constructions such as direct and semi-direct products, Sylow theorems.

Prof. Rasala

Spring and Summer Qtrs.

### 10.255 Algebra

(Prereq. 10.254) 4 Cl.; 4 Q.H.

Vector spaces and linear transformations: bases; inner product spaces; orthogonal and normal matrices; quadratic forms, equivalence; similarity and canonical forms for matrices.

Prof. Rasala

Spring and Summer Qtrs.

### 10.256 Algebra

(Prereq. 10.254) 4 Cl.; 4 Q.H.

Theory of fields: field extensions; automorphisms; Galois theory; applications to theory of equations.

Prof. Bridger

Offered 1971-72

Fall and Winter Qtrs.

### 10.261 Projective Geometry

(Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.

Analytic and synthetic projective geometry. Coordinatization of the Desarguan plane; collineation groups;  $n$ -dimensional projective space.

Fall and Winter Qtrs.

### 10.262 Differential Geometry

(Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.

Curves in space; properties of surfaces; differentiable manifolds; tangent spaces; curvature.

Prof. Sherman

Spring and Summer Qtrs.

### 10.263 Topology

(Prereq. 10.251) 4 Cl.; 4 Q.H.

Metric spaces; topological spaces; continuity; separation axioms; compactness; connectedness; complete metric spaces.

Prof. Staknis

Fall and Winter Qtrs.

### 10.271 Foundations of Mathematics

(Prereq. 10.252, 10.206) 4 Cl.; 4 Q.H.

Logic; sets and relations; axiom of choice; cardinal and ordinal numbers.

Mr. Josephson

Fall and Winter Qtrs.

### 10.272 Foundations of Mathematics

(Prereq. 10.271) 4 Cl.; 4 Q.H.

Properties of axiomatic systems; the real number system and other abstract spaces.

Mr. Josephson

Spring and Summer Qtrs.

### 10.273 History of Mathematics

(Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.

Development of the various branches of mathematics; lives of outstanding mathematicians; growth of mathematical knowledge and its relation to culture. (This course may not be used as one of the mathematics electives required of the pure option.)

Prof. Dean

Fall and Winter Qtrs.

### 10.274 Number Theory

(Prereq. 10.205, 10.206) 4 Cl.; 4 Q.H.

The properties of positive integers, divisibility, congruences, quadratic residues, Diophantine equations.

Prof. Bridger

Offered 1971-72

10.295, 10.296, 10.297, 10.298 Honors Program  
Staff

(each) 1 Cl.; 4 Q.H.  
All Quarters

## Physics

This department rotates its teachers.

### 11.110 Physics Laboratory for Engineering Students I

3 Lab.; 1 Q.H.

The first quarter of a two-quarter laboratory sequence in which the student performs experiments from various fields of physics.

Fall and Winter Qtrs.

### 11.111 Physics Laboratory for Engineering Students II

(Prereq. 11.110) 3 Lab.; 1 Q.H.

Continuation of 11.110.

Spring and Summer Qtrs.

### 11.115 Physics for the Humanities Students I (Fundamentals of Physics)

4 Cl.; 4 Q.H.

The first quarter of a two-quarter sequence intended primarily for students in the humanities and social sciences. Some of the basic principles governing the physical universe are established without using more mathematics than simple algebra. This course is directed at the intellectually curious student and attempts both to teach him some physics and to show him how scientific modes of thought are related to others with which he is more familiar. The first quarter discusses material in mechanics and thermodynamics.

Fall and Winter Qtrs.

### 11.116 Physics for the Humanities Students II (Prereq. 11.115) 4 Cl.; 4 Q.H.

Continuation of 11.115. Electromagnetic theory and atomic physics.

Winter, Spring and Summer Qtrs.

### 11.117 Physics for Science Majors I

4 Cl.; 4 Q.H.

Kinematics, Newton's Laws of Motion, Momentum and Energy, The Conservation Laws, Gravitation.

### 11.118 Physics for Science Majors II

(Prereq. 11.117) 4 Cl.; 4 Q.H.

Fluid mechanics, Heat, Wave Motion, Optics.

Fall and Winter Qtrs.

### 11.119 Physics for Science Majors III

(Prereq. 11.117) 4 Cl.; 4 Q.H.

Electrostatics, Currents, Magnetic Fields, Electromagnetism. (Students taking only two quarters should choose 11.117 and 11.119 rather than 11.117 and 11.118.)

Spring and Summer Qtrs.

### 11.124 Physics Laboratory for Science Majors

3 Lab.; 1 Q.H.

The first quarter of a two quarter laboratory sequence in which students perform experiments from various fields of physics.

Fall and Winter Qtrs.

- 11.125 Physics Laboratory for Science Majors II** (Prereq. 11.124) 3 Lab.; 1 Q.H.  
Continuation of 11.124.  
Spring and Summer Qtrs.
- 11.154 Introductory Physics IV** 4 Cl.; 4 Q.H.  
Continuation of Physics for Science Majors.  
Fall and Winter Qtrs.
- 11.155 Introductory Physics V** (Prereq. 11.154) 4 Cl.; 4 Q.H.  
Continuation of 11.154.  
Spring and Summer Qtrs.
- 11.171 Physics for Health Science Students I (Basic Physics)** 4 Cl.; 4 Q.H.  
The first quarter of a two-quarter physics sequence intended primarily for students in biology, pharmacy, and physical therapy. No calculus required. The emphasis is on the laws of physics as they relate to problems in the life sciences. The first quarter discusses topics in mechanics, thermodynamics and wave.  
Fall and Winter Qtrs.
- 11.172 Physics for Health Science Students II** (Prereq. 11.171) 4 Cl.; 4 Q.H.  
Continuation of 11.171. Electricity and magnetism and light.  
Spring and Summer Qtrs.
- 11.173 Physics Laboratory for Health Science Students I** 3 Lab.; 1 Q.H.  
The first quarter of a two-quarter laboratory sequence that accompanies 11.171 and 11.172. The student performs experiments from various fields of physics.  
Fall and Winter Qtrs.
- 11.174 Physics Laboratory for Health Science Students II**  
(Prereq. 11.173) 3 Lab.; 1 Q.H.  
Continuation of 11.173.  
Spring and Summer Qtrs.
- 11.200 Mechanics I** (Prereq. 11.154 or 11.123 or 11.205, and 10.205 or 10.145) 4 Cl.; 4 Q.H.  
The first quarter of a two-quarter sequence in classical mechanics. Vector analysis. Kinematics and dynamics of particle motion. Generalized coordinates and Lagrange's equations of motion.  
Fall and Winter Qtrs.
- 11.201 Mechanics II** (Prereq. 11.200) 4 Cl.; 4 Q.H.  
Continuation of 11.200. Conservation theorems Central force motion. Systems of particles. Rigid body motion. Hamilton's equation.  
Fall and Spring Qtrs.
- 11.203 Physics for Engineering Students I (Elementary Physics)** 4 Cl.; 4 Q.H.  
The first quarter of a four-quarter sequence intended primarily for engineering

students. The student is assumed to be concurrently taking a four-quarter calculus sequence. The aim of the course is to give the student a working knowledge of physics. The first quarter discusses vector algebra and the dynamics of particle motion.

Fall Qtr.

- 11.204 Physics for Engineering Students II** (Prereq. 11.203) 4 Cl.; 4 Q.H.  
Continuation of 11.203. Conservation laws and their use in solving problems in elementary dynamics. Wave motion and vibrating systems.

Winter Qtr.

- 11.205 Physics for Engineering Students III** (Prereq. 11.204) 4 Cl.; 4 Q.H.  
Continuation of 11.204. Electricity and magnetism.

Spring Qtr.

- 11.206 Physics for Engineering Students IV** (Prereq. 11.205) 4 Cl.; 4 Q.H.  
Continuation of 11.205. Circuit theory. Electromagnetic waves. Light.

Fall and Winter Qtrs.

**11.207 Elementary Modern Physics**

(Prereq. 11.206 or 11.123 or 11.154) 4 Cl.; 4 Q.H.

Special relativity and quantum physics. The properties of light and the structure of atoms and nuclei. Primarily intended for engineering and chemistry majors.

Spring and Summer Qtrs.

- 11.208 Mathematical Physics** (Prereq. 11.154 or 11.123 or 11.206, and 10.205 or 10.145) 4 Cl.; 4 Q.H.

Review of linear algebra and vector calculus. Special functions and partial differential equations of physics. Potential theory. Functions of a complex variable.

Winter and Spring Qtrs.

- 11.211 Electricity and Magnetism I** (Prereq. 11.154 or 11.123 or 11.206, and 11.208 or 10.207 or 10.221) 4 Cl.; 4 Q.H.

The first quarter of a two-quarter sequence in electromagnetic theory. Maxwell's equations and their experimental basis. Electrostatics and magnetostatics. The electromagnetic field in empty space. Electromagnetic waves.

Fall and Winter Qtrs.

- 11.212 Electricity and Magnetism II** (Prereq. 11.211) 4 Cl.; 4 Q.H.

Continuation of 11.211. Energy and momentum in the electromagnetic field. Electrodynamics: the interaction of matter and the field. Radiation.

Spring Qtr.

**11.220 Thermodynamics and Kinetic Theory**

(Prereq. 11.154, 11.123 or 11.206, and 10.205 or 10.145) 4 Cl.; 4 Q.H.

First and second laws of thermodynamics. Entropy and equilibrium. Thermodynamic potentials. Elementary kinetic theory. Statistical mechanics and the statistical interpretation of entropy.

Fall and Spring Qtrs.

**11.230 Modern Physics**(Prereq. 11.155 or 11.207 or 11.123, and  
10.205 or 10.145) 4 Cl.; 4 Q.H.

A review of experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. The course discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state and elementary particles.

Winter and Spring Qtrs.

**11.240 Quantum Mechanics I**

(Prereq. 11.230, 10.207) 4 Cl.; 4 Q.H.

The first of a two-quarter sequence in quantum mechanics. Observations of macroscopic and microscopic bodies. The uncertainty principle. Wave-particle duality. Probability amplitudes. Schrodinger wave theory. One-dimensional problems.

Fall and Winter Qtrs.

**11.241 Quantum Mechanics II**

(Prereq. 11.240) 4 Cl.; 4 Q.H.

Continuation of 11.240. Discrete and continuous states. Schrodinger equation in 3 dimensions. Angular momentum. General theory of quantum mechanics. Applications.

Spring Qtr.

**11.260 Wave Laboratory**

(Prereq. 11.155 or 11.123 or 11.206) 2 Cl.; 3 Lab.; 4 Q.H.

A general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena. The differential wave equation and its application to selected topics. Interference and diffraction theory from the standpoint of the Huygens-Fresnel and Kirchoff formulations. Selected experiments in acoustics, optics, and microwaves to illustrate these problems.

Fall and Winter Qtrs.

**11.271 Electronics Laboratory**

(Prereq. 11.155 or 11.123 or 11.206) 1 Cl.; 4 Lab.; 3 Q.H.

Electronic circuits. Pulse techniques. Logic circuits. The photomultiplier. Atomic detectors.

Fall and Spring Qtrs.

**11.272 Experimental Laboratory**

(Prereq. 11.271) 1 Cl.; 4 Lab.; 3 Q.H.

Experiments investigating the atomic nature of matter, the properties of the electron, and special relativity. The work involves vacuum system techniques and machine-shop practice.

Winter and Spring Qtrs.

**11.273 Advanced Physics Laboratory**

(Prereq. 11.272) 1 Cl.; 4 Lab.; 3 Q.H.

Special projects in modern experimental physics.

Fall and Winter Qtrs.

**11.290, 11.291, 11.292, 11.295, 11.296, 11.297, 11.298, Honors Program**

All Quarters



# Chemistry

- 12.101 General Chemistry** 2 Cl.; 3 Lab.; 3 Q.H.  
Introduction to the principles of chemistry, with emphasis on stoichiometry, ionic solutions and the inorganic chemistry of biological systems.  
Prof. Boig Fall Qtr.
- 12.102 General Chemistry** (Prereq. 12.101) 2 Cl.; 3 Lab.; 3 Q.H.  
Introduction to organic chemistry with emphasis on compounds of biological significance.  
Prof. Boig Winter Qtr.
- 12.103 General Chemistry** 4 Cl.; 3 Lab.; 5 Q.H.  
For chemistry majors and selected biology majors. Stoichiometry; atomic structure; chemical bonding; acids and bases, oxidation-reduction; states of matter; solutions. Laboratory: introduction to qualitative analysis.  
Prof. Huber Fall Qtr.
- 12.104 General Chemistry** (Prereq. 12.103) 4 Cl.; 3 Lab.; 5 Q.H.  
For chemistry majors and selected biology majors. Chemical equilibria; introduction to chemical thermodynamics and kinetics; electrochemistry; nuclear chemistry; topics in inorganic and organic chemistry. Laboratory: qualitative analysis.  
Prof. Huber Winter Qtr.
- 12.105 Analytical Chemistry** (Prereq. 12.104) 4 Cl.; 3 Lab.; 5 Q.H.  
The principles and practice of experimental measurements by means of chemical reactions. Laboratory: quantitative analysis.  
Prof. Jankowski Spring Qtr.
- 12.106 General Chemistry** 4 Cl.; 3 Lab.; 5 Q.H.  
For non-chemistry majors. Basic concepts and definitions; the mole concept and chemical stoichiometry; states of matter; solutions; periodicity of elements; atomic structure; chemical bonding and reactions.  
Prof. Cass Fall and Winter Qtrs.
- 12.107 General Chemistry** (Prereq. 12.106) 4 Cl.; 3 Lab.; 5 Q.H.  
For non-chemistry majors. Chemical kinetics and equilibria; acids and bases; elementary thermodynamics; electrolysis and electrochemistry; nuclear chemistry.  
Prof. Keller Winter and Spring Qtrs.
- 12.108 Fundamentals of Chemical Sciences** 4 Cl.; 4 Q.H.  
Development and discussion of important ideas of chemical science. Intended for students with minimal science or mathematics background. Pass-fail.  
Prof. Weiss Winter and Spring Qtrs.

- 12.114 General Chemistry** 4 Cl.; 4 Q.H.  
Primarily for engineering students. Introduction to the principles of chemistry, focusing upon the states and structure of matter and chemical stoichiometry.  
Prof. Davis Fall and Winter Qtrs.
- 12.115 General Chemistry** (Prereq. 12.114) 4 Cl.; 4 Q.H.  
Primarily for engineering students. Introduction to the principles of chemistry, focusing upon chemical equilibria and the nature of some common materials.  
Prof. Reiff Winter and Spring Qtrs.
- 12.135 General Chemistry** 3 Cl.; 3 Lab.; 4 Q.H.  
Matter and energy, atomic structure, periodic properties of the representative elements, chemical bonding, stoichiometry, states of matter, solutions of non-electrolytes. Laboratory experiments illustrating these principles.  
Prof. Spinos Fall and Winter Qtrs.
- 12.136 General Chemistry** (Prereq. 12.135) 3 Cl.; 3 Lab.; 4 Q.H.  
Qualitative analysis schemes, chemical equilibrium, acids and bases, solutions of electrolytes, ionic equilibrium, oxidation-reduction reactions, nuclear chemistry. Laboratory experiments illustrating these principles.  
Prof. Spinos Spring and Summer Qtrs.
- 12.144 Organic Chemistry** (Prereq. 12.104, 12.107, or 12.136) 4 Cl.; 3 Lab.; 5 Q.H.  
Nomenclature, preparation, properties, and reactions of common organic compounds.  
Prof. Jones Fall and Winter Qtrs.
- 12.145 Organic Chemistry** (Prereq. 12.144) 4 Cl.; 3 Lab.; 5 Q.H.  
Continuation of 12.141.  
Prof. Jones Spring and Summer Qtrs.
- 12.147 Organic Chemistry** (Prereq. 12.115) 3 Cl.; 3 Lab.; 4 Q.H.  
Aliphatic compounds; preparation, properties, and reactions of the more common classes of open-chain compounds; electronic interpretation of structures and reactions; petrochemicals; synthetic resins; carbohydrates; fats; proteins.  
Prof. Zuffanti Fall and Winter Qtrs.
- 12.148 Organic Chemistry** (Prereq. 12.147) 3 Cl.; 3 Lab.; 4 Q.H.  
Aromatic compounds; preparation, properties, and reactions of the more common classes of aromatic compounds; electronic interpretation of structures and reactions of aromatic compounds; dyes, commercial solvents and important industrial products. A brief introduction to alicyclic and heterocyclic compounds.  
Prof. Zuffanti Spring and Summer Qtrs.
- 12.153 Organic Chemistry** (Prereq. 12.105) 3 Cl.; 3 Q.H.  
Syntheses and properties of aliphatic and aromatic hydrocarbons and their functional derivatives; correlation between the structure of organic compounds and their physical and chemical properties; electronic interpretation of organic reactions.  
Prof. Viola Fall and Winter Qtrs.

- 12.154 Organic Chemistry** (Prereq. 12.153) 3 Cl.; 6 Lab.; 5 Q.H.  
Continuation of 12.153.  
Prof. Viola Spring and Summer Qtrs.
- 12.155 Organic Chemistry** (Prereq. 12.154) 3 Cl.; 6 Lab.; 5 Q.H.  
Continuation of 12.154.  
Prof. Howell Fall and Winter Qtrs.
- 12.161 Physical Chemistry** (Prereq. 10.152 and 11.118 or equivalent)  
3 Cl.; 3 Lab.; 4 Q.H.  
Chemical thermodynamics.  
Prof. Wiener Fall and Winter Qtrs.
- 12.162 Physical Chemistry** (Prereq. 12.161) 3 Cl.; 3 Lab.; 4 Q.H.  
Phase equilibria, solutions, kinetic theory of gases, chemical kinetics.  
Prof. Wiener Spring and Summer Qtrs.
- 12.166 Physical Chemistry** (Prereq. 10.152 and 11.118 or equivalent)  
3 Cl.; 3 Q.H.  
Similar to 12.161, but without laboratory.  
Prof. Wiener Fall and Winter Qtrs.
- 12.167 Physical Chemistry** (Prereq. 12.161 or 12.166) 3 Cl.; 6 Lab.; 5 Q.H.  
Similar to 12.162, but with expanded laboratory.  
Prof. Wiener Spring and Summer Qtrs.
- 12.168 Physical Chemistry** (Prereq. 12.162 or 12.167) 3 Cl.; 3 Lab.; Q.H.  
Quantum chemistry; particles and waves; Schroedinger wave mechanics; the chemical bond.  
Staff Fall and Winter Qtrs.
- 12.171 Analytical Chemistry** (Prereq. 12.145) 3 Cl.; 3 Lab.; 4 Q.H.  
Theories, principles, and applications of volumetric, gravimetric, and instrumental methods of analysis.  
Prof. Spinos Fall and Winter Qtrs.
- 12.179 Instrumental Analysis** (Prereq. 12.105) 3 Cl.; 6 Lab.; 5 Q.H.  
The principles and practice of measurements of chemical systems. Instrumental methods of analysis.  
Prof. Jankowski Fall and Winter Qtrs.
- 12.180 Ocean Chemistry** (Prereq. 12.105 or 12.171) 3 Cl.; 3 Lab.; 4 Q.H.  
Chemical interaction in sea water. Equilibrium principles. Composition of sea water and its measurement. Laboratory is conducted at Marine Science Institute, Nahant.  
Prof. Jankowski Fall and Winter Qtrs.
- 12.185 Inorganic Chemistry** (Prereq. 12.105) 2 Cl.; 2 Q.H.  
A survey of properties and reactions of inorganic compounds.  
Staff Spring and Summer Qtrs.

- 12.186 Biochemistry I** (Prereq. 12.145 or 12.155) 3 Cl.; 3 Q..H  
Cell biochemistry. Emphasis is on biochemical energetics, enzyme processes, and carbohydrate and lipid metabolism.  
Prof. Clagett Fall and Winter Qtrs.
- 12.187 Biochemistry I Laboratory** (Prereq. 12.145 or 12.155) 6 Lab.; 2 Q.H.  
Selected experiments in biochemistry.  
Prof. Clagett Fall and Winter Qtrs.
- 12.188 Biochemistry II** (Prereq. 12.186) 3 Cl.; 3 Q.H.  
Continuation of Biochemistry I. Amino acid and nucleic acid metabolism, enzyme control, photobiology, and applications of biochemical processes in nutrition and physiology.  
Prof. Clagett Spring and Summer Qtrs.
- 12.189 Biochemistry II Laboratory** (Prereq. 12.187) 6 Lab.; 2 Q.H.  
Continuation of Biochemistry I laboratory.  
Prof. Clagett Spring and Summer Qtrs.
- 12.213 Advanced Inorganic Chemistry** (Prereq. 12.211) 4 Cl.; 4 Q.H.  
Modern principles of bonding, structure, and reactivity of inorganic compounds.  
Staff Spring and Summer Qtrs.
- 12.251 Advanced Organic Chemistry** (Prereq. 12.155) 3 Cl.; 3 Q.H.  
An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material.  
Prof. Cass Fall and Winter Qtrs.
- 12.253 Identification of Organic Compounds** (Prereq. 12.155) 1 Cl.; 6 Lab.; 3 Q.H.  
Qualitative analysis of organic compounds having one or two functional groups. Single liquids, single solids, liquid mixtures, solid mixtures, and some industrial products are analyzed.  
Prof. Zuffanti Fall and Winter Qtrs.
- 12.261 Advanced Physical Chemistry** (Prereq. 12.168) 3 Cl.; 3 Q.H.  
Introduction to wave mechanics, atomic structure, spectroscopy.  
Prof. Wiener Fall and Winter Qtrs.
- 12.271, 12.272, 12.273,** (each) 3 Q.H.  
**12.274, 12.275, 12.276 Undergraduate Research** (each) 4 Q.H.  
Original experimental work under the direction of a staff member. Participation may begin in the middle year and will normally continue through the senior year. Approval of the administering committee is required.  
Staff All Quarters
- 12.284 Advanced Chemical Synthesis** (Prereq. 12.155) 9 Lab.; 3 Q.H.  
Special projects in the synthesis of organic and/or inorganic compounds, using advanced techniques.  
Staff Fall and Winter Qtrs.

**12.286 Advanced Chemical Measurements**

(Prereq. 12.163 and 12.179) 9 Lab.; 3 Q.H.

Laboratory problems in analytical and/or physical chemistry.

Staff

Fall and Winter Qtrs.

**12.288 Special Topics**

(Prereq. 12.163) 4 Cl.; 4 Q.H.

Staff

Spring Qtr.

**12.291, 12.292, 12.293, 12.294 Honors Program**

(each) 4 Q.H.

All Quarters

## Earth Sciences

**16.104 Introduction to Earth Science**

4 Cl.; 4 Q.H.

Considers both the solid and liquid environments of the earth. The forces and factors producing changes in these environments are examined in some detail and are applied to an understanding of the historical development of the earth.

Mr. Ross and Staff

Fall and Winter Qtrs.

**16.105 Introduction to Earth Science**

(Prereq. 16.104) 4 Cl.; 4 Q.H.

A continuation of 16.104. Consideration of the gaseous envelope surrounding the earth and the meteorological phenomena that occur within it is followed by a study of the earth as an astronomical body. Particular emphasis is placed on the behavior of the earth as a member of the solar system.

Mr. Ross and Staff

Winter and Spring Qtrs.

**16.111 Earth Science I**

3 Cl.; 2 Lab.; 4 Q.H.

An introduction to geology examining the rocks and minerals of which the earth is composed and the constructive and destructive processes operating on the crustal material to form a variety of topographic features.

Fall and Winter Qtrs.

**16.112 Earth Science II**

(Prereq. 16.111) 3 Cl.; 2 Lab.; 4 Q.H.

The features and forces of weather are studied with emphasis on their immediate significance to an individual devoted to extensive out-of-door activities. Atmospheric processes, weather signs, weather patterns and techniques in local short-range forecasting are of primary concern. Exercises in weather-map preparation, analysis, and interpretation.

A study of astronomical features both within and beyond the solar system. Special attention to observational aids and techniques.

Spring and Summer Qtrs.

**16.121 Introduction to Natural History I**

3 Cl.; 2 Lab.; 4 Q.H.

The identifying characteristics, life history, ecological relationships, and economic importance of insects, land and aquatic plants, and animals and plants of the tidal zone. Special laboratory attention is focused on life that is found within the immediate environmental area.

Prof. Wilmarth

Fall and Summer Qtrs.

## 262 / EARTH SCIENCES

- 16.122 Introduction to Natural History II** 3 Cl.; 2 Lab.; 4 Q.H.  
The identifying characteristics, life history, ecological relationships, and economic importance of common fish, amphibians and reptiles, birds, and mammals. The laboratory periods are devoted to geological and astronomical topics.  
Prof. Wilmarth Winter and Spring Qtrs.
- 16.125 Environmental Conservation** 4 Cl.; 4 Q.H.  
Problems relating to the use and preservation of the earth's environment. Both renewable and non-renewable resources will be considered with special emphasis given to urban environmental problems.  
Profs. Overcash and Ruggles Fall, Winter, and Spring Qtrs.
- 16.131 Oceanography I** 3 Cl.; 2 Lab.; 4 Q.H.  
The geology of the ocean basins, and the physical and chemical properties of sea water; the development of ocean currents and the important effects these currents have on the land masses of the world.  
Profs. Gordon and Ruggles Fall, Winter, and Spring Qtrs.
- 16.132 Oceanography II** 3 Cl.; 2 Lab.; 4 Q.H.  
The productivity of animal and plant life in the various zones of the ocean; the growing economic importance of the oceans as a source of food for the expanding world population.  
Prof. Gordon Fall, Winter, and Spring Qtrs.
- 16.135 Geology of New England** (Prereq. 16.141) 4 Cl.; 4 Q.H.  
A systematic study of significant topographic features of New England and the geological forces and processes involved in their formation. Included for study will be the Boston Basin, the Connecticut River Valley, New England coastal features, the White and Green Mountains.  
Prof. Newman Spring and Summer Qtrs.
- 16.136 Geology of North America** (Prereq. 16.141) 4 Cl.; 4 Q.H.  
The North American continent with emphasis on the structure and geologic development of the various subdivisions such as coastal plain, Appalachians, Basin and Range System, Rocky Mountain System, etc.  
Prof. Newman Fall and Winter Qtrs.
- 16.137 Paleontology** (Prereq. 16.142) 3 Cl.; 2 Lab.; 4 Q.H.  
The nature of the fossil record, the use of fossils for geologic dating and correlation, and the record of evolution will be used for the interpretation of ancient environments. Several major groups of fossil organisms will be studied in the laboratory.  
Fall and Winter Qtrs.
- 16.138 Marine Geology** (Prereq. 16.142) 4 Cl.; 4 Q.H.  
General survey of the topography, structure, and geologic history of the ocean basins and submerged continental margins. Discussion of marine sedimentary processes, patterns of sediment distribution, and relevant topics on waves, and currents.  
Spring and Summer Qtrs.

- 16.141 Physical Geology** 3 Cl.; 2 Lab.; 4 Q.H.  
 Natural phenomena ranging from landscape forms and scenery to the catastrophes brought about by earthquakes, volcanic eruptions, floods, and hurricanes. Field trips will emphasize cause and effect.  
 Profs. Morgenstern and Newman Fall and Winter Qtrs.
- 16.142 Historical Geology** (Prereq. 16.141) 3 Cl.; 2 Lab.; 4 Q.H.  
 The unfolding of the history of the earth, its inhabitants and its events in answer to the question "When?" Emphasis will be placed on the origin of the earth, the succession of life on earth, and the coming of man.  
 Profs. Morgenstern and Newman Winter, Spring, and Summer Qtrs.
- 16.143 Geomorphology** (Prereq. 16.141) 4 Cl.; 4 Q.H.  
 The origin and evolution of landscape features by processes operating at or near the earth's surface will be considered. Glacial desert and mountain areas will be emphasized.  
 Prof. Morgenstern Fall and Winter Qtrs
- 16.144 Economic Geology** (Prereq. 16.141) 4 Cl.; 4 Q.H.  
 The composition, occurrence, distribution, procurement, and uses of some of the more valuable minerals will be considered. Emphasis will be placed on metals, petroleum, coal, and gemstones.  
 Prof. Morgenstern Spring and Summer Qtrs.
- 16.145 Mineralogy** (Prereq. 16.141) 3 Cl.; 2 Lab.; 4 Q.H.  
 The development of mineralogy and its place in the broader discipline of the earth sciences. Emphasis will be placed on atomic structure and mineral formation, classification, crystal growth, geometry of crystals, physical properties, and optical properties.  
 Prof. Morgenstern Spring and Summer Qtrs.
- 16.146 Stratigraphy and Sedimentation** (Prereq. 16.142) 4 Cl.; 4 Q.H.  
 The lithologic properties and stratigraphic relationships of sedimentary rock will be studied. Sedimentary processes, facies and provinces of deposition will be considered in conjunction with the collecting and evaluation of stratigraphic data. Classic stratigraphic sequences will be reviewed with emphasis on the general stratigraphic principles illustrated by these sequences.
- 16.161 Observational Astronomy** 4 Cl.; 4 Q.H.  
 An introduction to the night sky as seen by the naked eye and with simple optical aids. The location and identification of constellations, major stars, planets, comets, and meteors. Three telescopic viewing sessions will be held.  
 Prof. Overcash Winter and Spring Qtrs.
- 16.164 Solar System Astronomy** 4 Cl.; 4 Q.H.  
 A detailed study of the earth as an astronomical body. Comparable and unique characteristics of the sun, moon, planets, asteroids, meteors, and comets are established. Instrumentation and data-gathering techniques provide the basis for description and interpretation.  
 Summer Qtr.



**16.180 Physical Geography I**

4 Cl.; 4 Q.H.

Constructed to bring an understanding of man's physical environment with concentration of study upon weather, climate, and vegetation on a world-wide scale.

Mr. Casarjian and Prof. Corbin

Fall and Winter Qtrs.

**16.182 Physical Geography II**

(Prereq. 16.180) 4 Cl.; 4 Q.H.

An interpretative description and analysis of landforms and soils. Emphasis will be placed on an examination of landform development and distribution.

Mr. Casarjian and Prof. Corbin

Winter, Spring, and Summer Qtrs.

**16.183 Regional Geography of Africa**

4 Cl.; 4 Q.H.

Regional analysis of historical, economic, political, cultural, and physical aspects of geography. A comparative case study approach will be utilized in order to accent regional differences.

Mr. Casarjian

Fall and Winter Qtrs.

**16.184 Regional Geography of Latin America**

4 Cl.; 4 Q.H.

Regional analysis of historical, economic, political, cultural, and physical aspects of geography. Population geography will also be examined. Problems in tropical development will be examined by means of a comparative case study approach.

Mr. Casarjian

Spring and Summer Qtrs.

**16.186 Applied Climatology**

(Prereq. 16.180) 4 Cl.; 4 Q.H.

The individual elements of climate are synthesized into climatic types and regions. Climatic classifications are employed as vehicles for describing the distribution of climates. Microclimatology and applied climatology and human dimensions of weather modification are introduced.

Mr. Casarjian

Winter, Spring, and Summer Qtrs.

**16.187 Urban Geography**

4 Cl.; 4 Q.H.

Geographic structures and functions of individual cities are elaborated and the factors which determine those structures studied. Theory of city systems is developed in detail and the modern megalopolitan forms explained. Processes and problems of city growth are investigated and an attempt is made to bring together the variety of ways in which such processes have been explained.

Prof. Corbin

Spring Quarter

**16.188 Economic Geography**

4 Cl.; 4 Q.H.

Basic principles of the space structure of the economy are outlined. Locational analysis deals with the individual, the firm, the city, and the national and international economy. Full discussion is conducted of geographic rent, minimum cost-point locations, spatial hierarchy, gravity and intervening opportunity (models) and potential models.

Prof. Corbin

Fall and Winter Qtrs.

**16.290 Directed Study**

(Prereq. Dept. Approval) 4 Q.H.

All Quarters



## Biology

- 18.106 Med. Tech. Orientation** 1 Cl.; 1 Q.H.  
Staff Winter Qtr.
- 18.107 Integrated Science** 4 Cl.; 3 Lab.; 4 Q.H.  
Principles of chemistry; principles of microbiology.  
Mrs. Curtis Fall Qtr.
- 18.108 Integrated Science** (Prereq. 18.107) 4 Cl.; 3 Lab.; 4 Q.H.  
Human anatomy and physiology.  
Mrs. Curtis Winter Qtr.
- 18.109 Integrated Science** (Prereq. 18.108) 4 Cl.; 3 Lab.; 4 Q.H.  
Human anatomy and physiology. Development and inheritance.  
Mrs. Curtis Spring and Summer Qtrs.
- 18.114 Functional Human Anatomy I** 4 Cl.; 3 Lab.; 5 Q.H.  
Introduction to cellular and tissue structure and function followed by anatomical terminology. Histology, anatomy, and physiology of bones, muscles, blood. Hemodynamics and principles of circulation. The laboratory includes a study of human bones, cat dissection, and related histology.  
Fall and Winter Qtrs.
- 18.115 Functional Human Anatomy II** (Prereq. 18.114) 4 Cl.; 3 Lab.; 5 Q.H.  
Anatomy and physiology of: respiratory system, digestive system, urogenital system, and nervous system. Physiology of endocrine system and a brief anatomy and physiology of eye and ear. The laboratory includes studies of muscle and nerve physiology, blood physiology and histology, and physiology of respiration.  
Spring and Summer Qtrs.
- 18.116 Clinical Pathology** (Prereq. 18.131) 3 Cl.; 6 Lab.; 4 Q.H.  
Introduction to the methods, principles, and theories in clinical pathology and clinical research.  
Prof. Karlsson
- 18.118 Organic Evolution** 4 Cl.; 4 Q.H.  
The major features of organic evolution with emphasis on vertebrate evolution, genetics, and physical influences.  
Prof. Moyer Fall Qtr.
- 18.119 Environment and Man** 4 Cl.; 4 Q.H.  
An ecological analysis of the human situation and of man's interaction with other organisms. The necessary foundation of biological principles will be presented.  
Staff Fall and Winter Qtrs.
- 18.120 Basic Microbiology** 3 Cl.; 4 Lab.; 4 Q.H.  
Microbial life, emphasizing morphological characteristics, physiological activities, and disease production.  
Staff Fall and Winter Qtrs.

- 18.125 Human Physiology** (Prereq. 18.141, 18.142 or equiv.)  
2 Cl.; 3 Lab.; 3 Q.H.  
Physical and biochemical activities of blood corpuscles, nerve and muscle fibers; functions of the nervous system, heart, and endocrines.  
Fall and Winter Qtrs.
- 18.126 Human Physiology** (Prereq. 18.125) 2 Cl.; 3 Lab.; 3 Q.H.  
Respiration and circulation; functions of the blood, lymph, kidneys; nutrition and digestion; sensory physiology and physiologic aspects of reproduction.  
Spring and Summer Qtrs.
- 18.131 General Biology** 3 Cl.; 4 Lab.; 4 Q.H.  
Universal properties and processes of living organisms. Cellular composition and cellular activities; inheritance and cellular control; the evolutionary process; environmental relationships.  
Staff  
Fall and Winter Qtrs.
- 18.132 Animal Biology** (Prereq. 18.131) 3 Cl.; 4 Lab.; 4 Q.H.  
Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation.  
Staff  
Winter and Spring Qtrs.
- 18.133 Plant Biology** (Prereq. 18.131-18.133) 3 Cl. 4 Lab.; 4 Q.H.  
Systematic study of the structure and function of plants, principally vascular plants. Survey of the plant-like protists and monorans.  
Staff  
Fall and Winter Qtrs.
- 18.134 Environmental and Population Biology**  
(Prereq. 18.131-18.133) 3 Cl.; 4 Lab.  
Detailed consideration of the physico-chemical factors influencing and influenced by organisms. Interactions among individual organisms and among species. Change of species by genetic natural selection.  
Prof. Ruber  
Spring and Summer Qtrs.
- 18.135 Genetics and Developmental Biology**  
(Prereq. 18.131-18.133) 3 Cl.; 4 Lab.; 4 Q.H.  
Elaboration of the classic laws of heredity. Cytogenetics. Chemical basis of heredity. Selected examples of the development of form and function.  
Profs. Moyer and Dealy  
Fall and Winter Qtrs.
- 18.136 Cell Biology** (Prereq. 18.131-18.133) 3 Cl.; 4 Lab.; 4 Q.H.  
Basic chemical and physical processes of cells related to their fine structure; oxidative and intermediary metabolism; photosynthesis; membrane phenomena; movement.  
Prof. Goolsby  
Spring and Summer Qtrs.
- 18.140 Hematology** (Prereq. 18.116) 3 Cl.; 3 Lab.; 4 Q.H.  
The normal and pathologic morphology of blood and blood-forming organs including the basics of immunohematology, coagulation, and some comparative hematology.  
Prof. Karlsson  
Fall and Winter Qtrs.

**18.141 Basic Animal Biology**

3 Cl.; 4 Lab.; 4 Q.H.

Principles of biology. Universal properties and processes of living organisms as exemplified by the cell and its activities. Inheritance, evolution, and environmental relationships.

Staff

Fall Qtr.

**18.142 Basic Animal Biology**

(Prereq. 18.141) 3 Cl.; 4 Lab.; 4 Q.H.

Structure and function of organ systems and animals. Diversity of animals considered from the evolutionary standpoint.

Staff

Winter Qtr.

**18.148 Human Anatomy**

3 Cl.; 3 Lab.; 4 Q.H.

The structure and development of the human body.

Prof. Shukri

All Quarters

**18.158 Vertebrate Physiology**

(Prereq. 8.131-18.133, 18.136) 3 Cl.; 3 Lab.; 4 Q.H.

Properties of living protoplasm; the general organization and function of cells; translocation of materials and the organization of animals; the physiology of the skeletal systems of man and animals; the physiology of amoeboid, ciliary and contractile movement with emphasis on muscle metabolism; the structure and function of neurons, reflex arcs, the autonomic nervous system, and the sensory receptors.

Prof. Pearincott

Fall and Winter Qtrs.

**18.159 Vertebrate Physiology**

(Prereq. 18.158) 3 Cl.; 3 Lab.; 4 Q.H.

Fluid media of animals, emphasizing water and electrolyte balance and kidney function in many; the physiology of blood, including its formation, functions, clotting, antigens and tests for identifying blood; the physiology of the heart, nervous control of the vascular system, breathing and gas transport, heat regulation, nutrition, digestion and assimilation; the endocrine secretions, and the physiologic aspects of reproduction.

Prof. Pearincott

Spring and Summer Qtrs.

**18.208 Comparative Vertebrate Anatomy**

(Prereq. 18.131 and 18.132) 3 Cl.; 6 Lab.; 5 Q.H.

Morphology and phylogeny of the vertebrates; laboratory studies on taxonomy of the group and specific morphology of the dogfish shark, the mud puppy, the alligator and the cat.

Prof. Ahlberg

Fall and Winter Qtrs.

**18.209 Embryology**

(Prereq. 18.131, 18.132, 18.135) 3 Cl.; 6 Lab.; 5 Q.H.

Gametogenesis, fertilization, cleavage, gastrulation, induction, organogenesis, and metamorphosis in vertebrates. Emphasis on frog, chick, and pig in the laboratory.

Prof. Ahlberg

Spring and Summer Qtrs.

**18.210 Invertebrate Zoology**

(Prereq. 18.131-18.135) 3 Cl.; 6 Lab.; 5 Q.H.

The invertebrate animals exclusive of the protozoans and insects.

Prof. Morse

Fall and Winter Qtrs.

- 18.211 Parasitology** (Prereq. 18.131, 18.136) 3 Cl.; 3 Lab.; 4 Q.H.  
Symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods.  
Profs. Morse, Riser, Meszoely Winter Qtr.
- 18.212 Vertebrate Paleontology**  
(Prereq. 18.131, 18.132, 18.134, 18.135 or permission of the instructor)  
3 Cl.; 3 hr. Lab.; 4 Q.H.  
Evolution of the vertebrates including man, as revealed through the fossil record. Laboratory, museum, and field studies.
- 18.220 General Microbiology**  
(Prereq. or Coreq. 18.135, 18.136 or permission of the instructor)  
3 Cl.; 4 Lab.; 4 Q.H.  
Basic detailed structure and function of micro-organisms and their interactions with their environments based on current knowledge and theory.  
Staff Spring and Summer Qtrs.
- 18.227 Animal Histology** (Prereq. 18.132) 3 Cl.; 3 Lab.; 4 Q.H.  
Microscopic study of fundamental types of animal tissues.  
Prof. Pearincott Fall Qtr.
- 18.228 Histological Technique** (Prereq. 18.131, 18.136) 1 Cl.; 6 Lab.; 3 Q.H.  
General methods of tissue preparation for purposes of microscopic study; preparation of solutions and stains; the microtome and its operation together with specific directions for fixation, clearing, hardening, embedding, section-cutting, and staining of tissues.  
Profs. Riser and Morse Winter and Spring Qtrs.
- 18.231 Lower Plants** (Prereq. 18.133) 3 Cl.; 3 Lab.; 4 Q.H.  
Systematic morphology and life cycles of monera and plant-like protista.  
Prof. Barkley Fall Qtr.
- 18.232 Higher Plants** (Prereq. 18.133) 3 Lec.; 3 hr. Lab.; 4 Q.H.  
Systematic morphology of the metaphyla.  
Prof. Barkley Winter Qtr.
- 18.233 Systematic Botany** (Prereq. 18.133) 2 Cl.; 6 Lab.; 4 Q.H.  
Classification and nomenclature of seed plants.  
Prof. Barkley
- 18.234 Plant Anatomy** (Prereq. 18.133) 2 Lec.; 6 hr. Lab.; 4 Q.H.  
Comparative developmental anatomy of seed plants.  
Prof. Joshi Spring Qtr.
- 18.235 Economic Botany** (Prereq. 18.133) 3 Lec.; 3 hr. Lab.; 4 Q.H.  
Structure, distribution, and cultivation of economic plants, food and medicinal plants, including those producing fibers, sugars, starches, rubber, gums, spices, and beverages.  
Prof. Khudairi Summer Qtr.

- 18.236 Horticulture** (Prereq. 18.133 or equiv.) 3 Cl.; 3 Lab.; 4 Q.H.  
Basic cultivation methods for ornamental and food plants. Offered evenings at the University Greenhouse.  
Prof. Khudairi Spring Qtr.
- 18.237 Introduction to Plant Physiology** (Prereq. 18.133) 3 Cl.; 6 Lab.; 5 Q.H.  
Physiological processes in plants at the cellular and organ levels including water relations, mineral nutrition, photosynthesis, respiration, protein and fat synthesis, growth, plant hormones, and development.  
Prof. Khudairi Fall Qtr.
- 18.240 Microbial Physiology** (Prereq. 18.220 or equiv.) 3 Cl.; 4 Lab.; 5 Q.H.  
The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation, rates of reaction and determination of end products.  
Prof. Rosenberg Winter and Summer Qtrs.
- 18.242 Medical Microbiology** (Prereq. 18.220 or equiv.) 3 Cl.; 4 hr. Lab.; 4 Q.H.  
The bacterial cell as a pathogen, stressing major genera of disease-producing organisms and factors influencing virulence.  
Prof. Gabliks Winter Qtr.
- 18.245 Serology—Immunology** (Prereq. 18.220 or equiv.) 3 Cl.; 3 Q.H.  
Current concepts concerning specific and nonspecific factors of resistance to microbial disease. Chemical and biological considerations of antigens and antibodies.  
Prof. Gainor Winter Qtr.
- 18.246 Serology—Immunology Laboratory** (Prereq. or Corequisite 18.245) 6 Lab.; 2 Q.H.  
Laboratory studies of procedures employed in biological research. Antibodies will be produced and qualitative and quantitative approaches to agglutination, precipitin, agar diffusion and other tests will be studied.  
Prof. Gainor Winter Qtr.
- 18.251 Comparative Animal Physiology** (Prereq. 18.132, 18.136 or equivs.) 3 Cl.; 3 Lab. 4 Q.H.  
Study of animal functions, their control, and their adaptiveness to various environments. Consideration of phylogeny of these adaptations and of their underlying cellular mechanisms. Emphasis on invertebrates and lower vertebrates, with comparisons to mammals.  
Prof. Wernitz Winter Qtr.
- 18.290, 18.291 Directed Study** (Prereq. completion of core biology program, 18.131-18.136) (each) 2 Q.H.  
Independent work on a chosen topic under the direction of members of the Department. Limited to qualified juniors and seniors with approval of the Department and special arrangements with the supervising faculty member.

The two quarters of this course together are counted as 1 elective course in the Biology Department.

Staff

All Quarters

**18.295, 18.296, 18.297, 18.298 Honors Program**

4 Q.H.

All Quarters

## Psychology

### **19.101 Introductory Psychology**

3 Cl.; 3 Q.H.

Psychological principles.

Prof. Warren and Staff

Fall Qtr.

### **19.102 Basic Psychology**

4 Cl.; 4 Q.H.

The basic principles of psychology.

Prof. Warren and Staff

Fall, Winter and Spring Qtrs.

### **19.105 Foundations of Psychology I**

4 Cl.; 4 Q.H.

Major concepts from most areas of psychological investigation; the experimental approach to the study of behavior including growth and development, individual differences, learning and social psychology.

Staff

Fall and Winter Qtrs.

### **19.106 Foundations of Psychology II**

(Prereq. 19.105) 4 Cl.; 4 Q.H.

The sensory bases of response, perception, motivation, emotions, personality, and behavioral disorders.

Staff

Spring and Summer Qtrs.

### **19.107 General Psychology I**

4 Cl.; 4 Q.H.

Introduction to the study of behavior. Major concepts in the biological bases of psychology, with emphasis on brain-behavior relationships and a comparative approach to the study of mental processes and motivation.

Prof. Warren

Fall and Winter Qtrs.

### **19.108 General Psychology II**

(Prereq. 19.107) 4 Cl.; 4 Q.H.

Emphasis is placed on relationships underlying sensory, perceptual developmental and learning phenomena.

Prof. Warren

Spring and Summer Qtrs.

### **19.120 Statistics in Psychology I**

(Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.

Descriptive statistics, including graphical presentation of data, measures of central tendency and variability for distributions, standard scores, regression and correlation; set theory and probability; expectation.

Profs. Arees, Schick

Fall and Winter Qtrs.

### **19.121 Statistics in Psychology II**

(Prereq. 19.120) 4 Cl.; 4 Q.H.

Probability distributions, including binomial and normal; sampling distributions; inferential statistics—estimation, hypothesis testing, decision-making—including z-test, t-test, f-test, chi-square; nonparametric tests.

Profs. Arees, Schick

Spring and Summer Qtrs.

**19.125 Quantitative Methods**

(Prereq. 19.120) 4 Cl.; 4 Q.H.

Basic principles of computer design and operation of interest to psychologists with emphasis on data processing, statistics, and on-line experimentation. Introduction to programming techniques and languages.

Prof. Armington

Spring Qtr.

**19.130 Social Psychology**

(Prereq. 19.106) 4 Cl.; 4 Q.H.

The analysis of the individual's behavior in social contexts; topics considered include the historical development of social psychology, socialization, national character, ethnic and class structure, prejudice, attitudes and attitude measurement, propaganda, crowd behavior, group membership and structure, leadership, and social movements.

Spring and Summer Qtrs.

**19.135 Personality**

(Prereq. 19.106) 4 Cl.; 4 Q.H.

A systematic study of the normal personality, its growth and development. Topics will include environmental and constitutional contributions, assessment of personality, research, and a survey of the major theories of personality.

Prof. Conn

Fall and Winter Qtrs.

**19.136 Personality**

(Prereq. 19.135) 4 Q.H.

Continuation of 19.135 Personality.

Prof. Conn

Spring and Summer Qtrs.

**19.138 Experimental Personality**

(Prereq. 19.161) 3 Cl.; 3 Lab.; 4 Q.H.

Introduction to methods and areas of research in personality. Includes problems of measurement; behavioral and dynamic concepts; an original project. Emphasis is on developing the student's sophistication in planning and interpreting research.

Prof. Lanyon

Fall and Winter Qtrs.

**19.140 Child and Adolescent Psychology**

(Prereq. 19.106 or 19.108 or 19.102) 4 Cl.; 4 Q.H.

Exploration of the processes of growth and development from infancy through adolescence; developmental theories of Piaget and Erikson; genetics; maturation; intelligence; cognition; personality; language; social behavior; emotion; motivation learning.

Prof. Zamansky

Fall and Winter Qtrs.

**19.141 Growth and Development I**

4 Cl.; 4 Q.H.

Emphasis on infancy and childhood. Fundamental processes of growth and development from conception to the beginning of adolescence; physical development and maturation; socialization; social and interpersonal relations; personality cognition; intelligence, emotion and motivation. Emphasis upon family setting as well as upon the broader social environment.

Prof. Pershonok

Fall and Winter Qtrs.

**19.142 Growth and Development II**

4 Cl.; 4 Q.H.

Adolescence and adulthood. Exploration of physical and social changes in



the years from adolescence to senescence. Consideration of special circumstances and problems associated with adult life.

Prof. Pershonok

Spring and Summer Qtrs.

**19.146 Motivation**

(Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.

The various aspects of motivation; primary and secondary drives; unconscious motivation; effective motivation; the assessment of motives.

Prof. Zamansky

Spring and Summer Qtrs.

**19.150 Perception**

(Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.

An introduction to the nature of the perceptual world; the nature of object recognition and identification, spatial organization, contextual effects, learning and perception, and the influence of attitudinal, motivational, and personality factors on perception.

Prof. Corwin

Spring and Summer Qtrs.

**19.153 Sensation**

(Prereq. 19.162) 4 Cl.; 4 Q.H.

Psychophysics and physiology of hearing, vision, touch, taste, smell. Problem-oriented introduction to sensory behavior.

Profs. Armington, Scharf

Spring and Summer Qtrs.

**19.155 Psychology of Language**

(Prereq. 19.106 or 108) 4 Cl.; 4 Q.H.

Topics will include the child's acquisition of language, verbal habits, the analysis and measurement of meaning, cultural determinants of linguistic behavior, communication processes, and recent research in psycholinguistics.

Prof. Brightbill

Fall and Winter Qtrs.

**19.156 Psychology of Thought**

(Prereq. 19.106 or 108) 4 Cl.; 4 Q.H.

Psychological factors in problem-solving, imagination intuition, information processing, and concept-learning will be considered.

Prof. Brightbill

Spring and Summer Qtrs.

**19.160 Experimental Psychology I**

(Prereq. 19.121) 3 Cl.; 3 Lab.; 4 Q.H.

Concentration upon the experimental method in the design, execution, analysis and reporting of psychological investigations. Laboratory experiments in the area of general experimental psychology.

Prof. Karis

Fall and Winter Qtrs.

**19.161 Experimental Psychology II**

(Prereq. 19.160) 3 Cl.; 3 Lab.; 4 Q.H.

A systematic analysis of methods in the investigation of basic animal and human learning processes; emphasis on experimental procedures, research findings, and theoretical interpretations; experiments on animal and human subjects.

Prof. Karis

Spring and Summer Qtrs.

**19.162 Experimental Psychology III**

(Prereq. 19.160) 3 Cl.; 3 Lab.; 4 Q.H.

Analysis of sensory experience and its physiological basis. Psychophysical and physiological methods and research findings in the investigation of vision, audition, olfaction, taste, and the skin senses. Laboratory work includes anatomical, neurophysiological and psychophysical techniques.

Prof. Schick

Fall and Winter Qtrs.



- 19.180 Physiological Psychology I** (Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.  
 Evolution of the nervous system; neural transmission; neurophysiology of the reticular formation, cortex, motor systems, skin senses, vision and audition.  
 Prof. Mahut Fall and Winter Qtrs.
- 19.181 Physiological Psychology II** (Prereq. 19.180) 4 Cl.; 4 Q.H.  
 Neural mechanisms of motivation and emotion, sleep, attention, perception, learning and memory.  
 Prof. Mahut Spring Qtr.
- 19.201 Psychology of Abnormal Behavior** (Prereq. 19.140) 4 Cl.; 4 Q.H.  
 The symptomatology, etiology, dynamics, and therapy of the abnormal personality; the basic varieties of neurosis and psychosis; somatic therapies and fundamental varieties of psychotherapy.  
 Prof. Pendleton Fall and Winter Qtrs.
- 19.202 Abnormal Psychology I** (Prereq. 2 yrs. psych.) 4 Cl.; 4 Q.H.  
 The abnormal personality; historical background; criteria of abnormality. Theoretical framework of normal and abnormal development; anxiety and defense; etiology, dynamics, and symptomatology of the neuroses.  
 Prof. Zamansky Fall and Winter Qtrs.
- 19.203 Abnormal Psychology II** (Prereq. 19.202) 4 Cl.; 4 Q.H.  
 Psychotherapy; etiology, dynamics, and symptomatology of the psychoses; psychosomatic, sociopathic, and organic disorders; somatic therapies; socio-cultural aspects.  
 Prof. Zamansky Spring and Summer Qtrs.
- 19.210 History of Psychology** (Prereq. 2 yrs. psych.) 4 Cl.; 4 Q.H.  
 Evaluation of modern psychology in the light of its historical origins.  
 Prof. Warren Fall and Winter Qtrs.
- 19.211 Systems of Psychology** (Prereq. 19.210) 4 Cl.; 4 Q.H.  
 Major schools of psychology which have influenced the development of modern psychology and contemporary systematic trends.  
 Prof. Karis Spring Qtr.
- 19.220 Psychological Testing** (Prereq. 19.120) 4 Cl.; 4 Q.H.  
 Basic principles of test theory, test administration, and test construction; familiarization with representative types of tests.  
 Prof. Pendleton Spring Qtr.
- 19.240 Industrial Psychology** (Prereq. 19.106 or 19.108) 4 Cl.; 4 Q.H.  
 Motivation of workers; employee attitudes and morale; industrial mental health; counseling; interviewing; personnel selection; psychological tests in industry; leadership; group decision methods; the optimal working environment.  
 Prof. Pendleton Spring Qtr.

- 19.290, 19.291 Directed Study** (Prereq. Dept. approval) (each) 4 Q.H.  
Independent work under the direction of members of the department upon a chosen topic. Limited to qualified juniors and seniors with the consent of the department.  
Staff All Quarters

- 19.295, 19.296, 19.297, 19.298 Honors Program** (each) 4 Q.H.  
All Quarters

## Anthropology

- 20.100 Principles of Social Anthropology** 4 Cl.; 4 Q.H.  
Basic principles.  
Staff All Quarters

- 20.130 Language and Culture** 4 Cl.; 4 Q.H.  
The function of language in human society, and an introduction to the relationship between the patterns of language and the patterns of culture.  
Fall and Winter Qtrs.

- 30.135 Individual and Culture** 4 Cl.; 4 Q.H.  
An exploration of the ways in which the individual is shaped by his society and the ways in which he can effect change.  
Spring and Summer Qtrs.

- 20.140 Evolution and Society** 4 Cl.; 4 Q.H.  
Human social and cultural evolution and the theories which account for it.  
Spring and Summer Qtrs.

- 20.160 Anthropology of the Family** 4 Cl.; 4 Q.H.  
Western scientific and popular conceptions and misconceptions about the nature of the family and family interaction in our own culture, in other cultures, and among animals. Advice on how to run a family will not be given!  
Fall and Winter Qtrs.

- 20.170 Culture in Transition** 4 Cl.; 4 Q.H.  
Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.  
Winter and Spring Qtrs.

- 20.201 Development of Anthropology Theory I** 4 Cl.; 4 Q.H.  
History of major contemporary orientations in the field. Evolutionary approaches, culture area, and historical analysis.

- 20.202 Development of Anthropology Theory II** 4 Cl.; 4 Q.H.  
Contemporary theoretical approaches: neo-evolutionism, structuralism, functionalism, role structure, comparative methods, social relations approaches.

**20.210 Tribal Societies and Cultures**

4 Cl.; 4 Q.H.

Cultural arrangements found among people with limited techniques for making a living. The structures and institutions of bands, tribes, and chiefdoms: comparative and functional studies of tribal societies and the dynamics of change under contact situations. Students will be required to deal with both descriptive and analytic materials.

**20.214 Peasant Society and Culture**

4 Cl.; 4 Q.H.

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industrialized societies.

**20.220 Anthropology Methods**

3 Cl.; 2 Lab.; 4 Q.H.

Theory and practice of methods of field research, with emphasis upon participant observation techniques, and the analysis of data. Students will take part in a field project.

**20.230 Language and Communication**

4 Cl.; 4 Q.H.

The application of models derived from the study of language to other aspects of behavior, including kinesics, semiotics.

**20.231 Language and Society**

4 Cl.; 4 Q.H.

Topics in societal linguistics: dialectic and social class, language contact, linguistic nationalism and linguistic problems in modernization.

**20.235 Cognitive Anthropology**

4 Cl.; 4 Q.H.

The study of cultural patterning of cognitive systems. Approaches such as formal semantics, world view, and ethnoscience will be discussed.

**20.238 Culture and Personality**

4 Cl.; 4 Q.H.

A critique of efforts to relate personal character and cultural milieu, with a discussion of current developments in this field.

**20.240 Human Origins**

4 Cl.; 4 Q.H.

An intensive look at the data on fossil remains and the data on contemporary primates which are essential for an understanding of human physical and behavioral evolution. Efforts will be made to bring the student into direct contact with primary materials.

**20.245 Cultural Ecology**

4 Cl.; 4 Q.H.

An introduction to questions of man's adaptation to environment and the effect of different human adaptations on natural systems.

**20.250 Political Anthropology**

4 Cl.; 4 Q.H.

Origins and growth of the institutions of civilization; specialization, social stratification in the dynamics of traditional civilizations. Also, some special topics of contact and change.

**20.255 Economic Anthropology**

4 Cl.; 4 Q.H.

Types of economic systems in simple societies: reciprocal, redistributive,

market exchange. Economic relations as part of social relations: land tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economics.

**20.257 Religion and Myth** 4 Cl.; 4 Q.H.

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization.

**20.259 Urban Anthropology** 4 Cl.; 4 Q.H.

Selected problems in anthropological studies in urban societies.

**20.260 Kinship and Society** 4 Cl.; 4 Q.H.

This is a course only for the advanced student. A variety of kinship systems and their terminological and structural components and the way in which their systems articulate with other social institutions.

**20.270 Culture and Change** 4 Cl.; 4 Q.H.

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

**20.280 New World Indian Ethnology** (Prereq. 20.100 or its equiv.) 4 Cl.; 4 Q.H.

The socio-political and ideological aspects of American Indian societies before major acculturation, emphasizing the functional interrelations of cultural and social institutions.

Spring and Summer Qtrs.  
Alternate Years

**20.290-91 Directed Study** (Prereq. Dept. approval) 4 Q.H.

Independent work under the direction of members of the Department upon a chosen topic. Limited to qualified seniors preparing in anthropology with approval of Department Chairman.

Staff All Quarters

**20.295, 20.296, 20.297, 20.298 Honors Program** (each) 4 Q.H.  
All Quarters

## Sociology

**21.100 Introduction to Sociology** 4 Cl.; 4 Q.H.

Sociology principles.  
Staff

**21.101 Principles of Sociology** 4 Cl.; 4 Q.H.

The basic principles of sociology.  
Staff

- 21.111 American Society** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 American society culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational; social classes and stratification, mobility, and individualism.  
 Staff
- 21.115 The Sociology of Everyday Life** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 The development, application, and consequences of rules for everyday activities (e.g. walking, talking, eating, drinking, sitting, smoking, laughing, crying, and sleeping); the effects of space, equipment, and territory on these activities on social life and the expression of the emotions.  
 Prof. Rubington Spring Qtr.
- 21.120 Sociology of the Family** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 The family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality, role-taking, and the effects of individualism, mobility, and industrialism.  
Fall and Winter Qtrs.
- 21.125 Social Welfare** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 An orientation course planned to acquaint the student with the nature and scope of social work. After a brief survey of the history and early leadership of the movement, the course centers on the modern situation and current trends in the field. The work of both public and private welfare agencies; field trips to various types of social agencies in the metropolitan area.  
Fall and Winter Qtrs.
- 21.130 Criminology** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 Patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal; administration of criminal justice: law courts, police, prisons.  
Fall and Winter Qtrs.
- 21.135 Juvenile Delinquency** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 The sociological and psychological approaches and their implications for a typology of delinquency; problems of prevention, treatment, and rehabilitation.  
Spring and Summer Qtrs.
- 21.137 Social Deviance** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 Analysis of various social problems, crime, juvenile delinquency, mental disorders, drug addiction, suicide, sexual behavior, poverty, war and others.  
Spring and Summer Qtrs.
- 21.138 Social Control** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.  
 Formation of social bonds and the conditions under which they are ruptured; the emergence of deviance as an interactional problem; the types of individual and societal reactions to the most prevalent forms of deviant behavior. Analysis of agencies of social control, their definitions of problems and responses to typical clients.  
Fall and Winter Qtrs.

**21.139 Social Problems** (Prereq. 21.101 or equiv.)

Analysis of five major sociological perspectives on social problems (pathology, disorganization, value-conflict, deviance, and labeling); the conditions under which certain recurrent events, activities, and persons become redefined as social problems (e.g., mine disasters, marijuana smoking, and alcoholics); study of the typical responses to social problems and their consequences.

Fall and Winter Qtrs.

**21.145 Urban Society** (Prereq. 21.101) 4 Cl.; 4 Q.H.

The foundations of city life in historical perspective; relationship of city life to environment, population, social organization, and cultural values; growth trends.

Fall and Winter Qtrs.

**21.150 Race and Cultural Relations** (Prereq. 21.101 or equiv.) 4 Cl.; 4 Q.H.

Racial nationalities and religious groups, particularly with reference to the United States; special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends.

Fall and Winter Qtrs.

**21.200, 21.201 Group Behavior—The Sociological Imagination**

(Consent of Instr.) 4 Cl.; 4 Q.H.

Limited to 15 students. An experimental course in which students act as a group in developing sociological imagination and perspective. Work will come first and discussion later; students will take much of the responsibility for learning in the group.

Prof. Geer

Fall, Winter, and Spring Qtrs.

**21.210 Individual and Society I** (Jr. and Sen. in Soc., or Consent) 4 Cl.; 4 Q.H.

The course emphasizes the interrelations between individuals and society. Topics might include prejudice, reference groups, role theory, leadership, aggression, communication and persuasion, and achievement.

**21.211 Individual and Society II** (Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

The seminar focuses on the interaction of psychological and group processes. Students will read original theoretical and research monographs in the field.

**21.215 Collective Behavior.** (Jrs. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

The rise of new group forms in response to persistent social unrest; study of masses, crowds, and publics; analysis of specific instances of collective behavior such as race riots, wildcat strikes, prison revolts and campus disorders.

Spring Qtr.

**21.221 Seminar in Social Welfare** (Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

The seminar focuses on selective problems and research in social welfare. The seminar utilizes a research project to integrate behavioral science with current social welfare practice.

Spring Qtr.

**21.239 Intro. to Statistical Analysis**

(Jr. and Sen. in Soc. or Consent) 3 Cl.; 2 Lab.; 4 Q.H.

Application to social data of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation.

Fall and Winter Qtrs.

**21.240 Research Methods I**

(Jr. and Sen. in Soc. or Consent) 3 Cl.; 2 Lab.; 4 Q.H.

An introduction to social research including survey techniques, design of research, interviewing, questionnaire construction, use of existing data, and content analysis. Students will take part in a survey.

Fall and Winter Qtrs.

**21.241 Research Methods II**

(Jr. and Sen. in Soc. or Consent) 3 Cl.; 2 Lab.; 4 Q.H.

Analysis of social data by means of coding, tabulating, and statistically interpreting information from surveys and other sources.

Spring and Summer Qtrs.

**21.245 Community Analysis**

(Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

Ecological, social structure, identity and social action aspects of human settlements.

**21.250 Political Sociology**

(Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

An examination of formal political structures and informal quasi-political groups. Sociological analysis of ideology, class politics, and mass movements. Discussion of the basis for seizing political power as indicated in theories of guerrilla warfare. Marxist-Leninism, Maoism, etc. Overall perspective will be the conflict of various social and economic groups as they vie for the political power and influence.

Spring and Summer Qtrs.

**21.255 Sociology of Formal Organizations**

(Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

A study of principles of formal organization. Theories of bureaucracy and concept of authority; communication systems and other conceptions of formal organization. Structure of work groups and their affect on the larger organization. The social content of organizations.

Fall and Winter Qtrs.

**21.260 Social Stratification**

(Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

Theories of social inequality, concepts of social class; aspects of status and role difference; criteria for social mobility.

Fall and Winter Qtrs.

**21.265 Sociology of Occupations and Professions**

(Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.

The meanings of work. Division of labor and specialization. Analysis of occupational structure and patterns of recruitment, training, and career preferences. The classic professions and new trends in professionalization.

Spring and Summer Qtrs.



**21.270 Social Change** (Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.  
Social and cultural dynamics with particular reference to the current contact situation occurring between industrialized and nonindustrialized societies.

**21.280 Social Theory I** (Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.  
The development of sociology from the history of social thought. The emergence of several schools beginning with Positivistic Organicism and Conflict Theory.

Fall and Winter Qtrs.

**21.281 Social Theory II** (Jr. and Sen. in Soc. or Consent) 4 Cl.; 4 Q.H.  
A seminar-lecture in which Formalism, Social Behaviorism, Social Action Theory and Functionalism are studied critically.

Spring and Summer Qtrs.

**21.290, 21.291 Directed Study** (Jr. and Sen. in Soc. or Consent) 4 Q.H.  
Independent work under the direction of members of the Department upon a chosen topic. Limited to qualified students with approval of Department chairman.

All Quarters

**21.292, 21.293 Seminar in Current Emphases in Sociology I and II**  
4 Cl.; 4 Q.H.

Review and discussion of selected sociological topics.

Fall, Winter and Spring Qtrs.

**21.295, 21.296, 21.297, 21.298 Honors Program** (each) 4 Q.H.  
All Quarters

## Political Science

**22.101 Introduction to Political Science I** 4 Cl.; 4 Q.H.  
Basic political concepts and forces of organization from the classical Greeks to the modern nation state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and a constitutional system.  
Staff

**22.102 Introduction to Political Science II** 4 Cl.; 4 Q.H.  
The development of operational liberty in the United States and its constitutional underpinnings are considered together with an analysis of the national American political process and the conduct of recent American foreign relations.  
Staff

Winter and Spring Qtrs.

**22.131 American National Government** (Prereq. 22.102) 4 Cl.; 4 Q.H.  
An analysis of the structure and functions of American Government: The development of legislative policy and the nature of constitutional restraints on public power.  
Prof. Worth

Spring and Summer Qtrs.



**22.133 Political Parties and Pressure Groups**

(Prereq. 22.102 or 22.131) 4 Cl.; 4 Q.H.

An analysis of political parties and pressure groups in the American political system focusing on collective decision-making, electoral strategy, and party responsibility.

Prof. Pfeiffer

**22.134 The American Presidency**

(Prereq. 22.102 or 22.131) 4 Cl.; 4 Q.H.

This course attempts a multi-faceted examination of the nation's Chief Executive. The Presidential electoral process, the President's many constituencies, the differing styles of various 20th-century Presidents, the constitutional and extra-constitutional powers of the office are some areas that will be considered.

Prof. Cord

**22.135 American Constitutional Law**

(Prereq. 22.102 or 22.131) 4 Cl.; 4 Q.H.

Employing excerpts of U.S. Supreme Court decisions and other reading materials, this course attempts an analysis of some of the theoretical, structural, and substantive issues inherent in and relevant to the American constitutional system.

Prof. Cord

**22.137 Civil Liberties**

(Prereq. 22.102 or 22.131) 4 Cl.; 4 Q.H.

Employing U.S. Supreme Court decisions and other reading material, this course examines the substantive and procedural guarantees of the Bill of Rights and the Fourteenth Amendment and their relationship to a liberal democratic society.

Prof. Cord

**22.141 State Government and Politics**

(Prereq. 22.102 or 22.131) 4 Cl.; 4 Q.H.

The structure, functions and politics of the states, analyzing their role in the Federal system and their relationships with the national government and their component local governments.

Prof. Berkley

**22.143 Urban and Metropolitan Government**

(Prereq. 22.141) 4 Cl.; 4 Q.H.

The political, structural and functional problems of an urbanizing United States, including analyses of urban, suburban and metropolitan governmental systems and their roles in the Federal system.

Prof. Medeiros

**22.151 Comparative Government**

(Prereq. 22.101) 4 Cl.; 4 Q.H.

European democratic and totalitarian forms of government. The United Kingdom, France, and West Germany.

Prof. Goldman

**22.171 Law and Society**

4 Cl.; 4 Q.H.

Introduction to the theory and philosophy of law; the historical foundations of the common law; legal methods. Primarily for non-Political Science majors.

Prof. Grimes

Summer Qtr.

- 22.175 Current Political Issues** 4 Cl.; 4 Q.H.  
An analysis of the constitutional and political background of selected contemporary public issues. Primarily for non-Political Science majors.  
Prof. Grimes Fall and Winter Qtrs.
- 22.177 American Political Process** 4 Cl.; 4 Q.H.  
This course is a general analysis of the American political system, including national, state and metropolitan governments and their interactions on each other. It is not open to Political Science majors or anyone who has taken 22.102 or 22.131 (American National Government).  
Prof. Grimes
- 22.179 World Politics** 4 Cl.; 4 Q.H.  
An analysis of the behavior of nations in international society, with emphasis on major current developments. Not open to Political Science majors or anyone who has taken 22.221 (International Relations).  
Prof. Jones
- 22.221 International Relations** (Prereq. 22.102) 4 Cl.; 4 Q.H.  
Elements and limitations of national power; contemporary world politics; problem of peace.  
Prof. Jones Fall and Winter Qtrs.
- 22.223 American Foreign Policy** (Prereq. 22.102) 4 Cl.; 4 Q.H.  
Formulation and conduct of foreign policy; role of the United States in politics since 1945.  
Prof. Wilfong
- 22.224 United States-Far Eastern Relations** (Prereq. 22.102) 4 Cl.; 4 Q.H.  
Diplomacy of the United States concerning the Far East, with both Asian and non-Asian governments. Emphasis on the American role in the evolution of the Far Eastern power distribution from World War II to the present.  
Prof. Jones
- 22.225 Soviet Government** (Prereq. 22.151) 4 Cl.; 4 Q.H.  
A study of Soviet political origins and behavior with emphasis on recent changes in the party and state apparatus, the economy, and the administration of justice.  
Prof. Goldman
- 22.226 Soviet Foreign Policy** (Prereq. 22.101 and Middler Status) 4 Cl.; 4 Q.H.  
The evolution of Soviet foreign policy since 1917 with emphasis on the development of the international Communist movement and the onset of the East-West ideological conflict.  
Prof. Goldman
- 22.227 Communism in Eastern Europe** (Prereq. 22.101 and Middler Status) 4 Cl.; 4 Q.H.  
The Communist governments of Eastern Europe with emphasis on their growing independence of Soviet Russia. Recent political change, economic lib-

eralization, and new orientation in foreign policy.  
Prof. Goldman

**22.228 Government and Politics in Africa**

(Prereq. 22.151 and Middler Status) 4 Cl.; 4 Q.H.

The governmental systems, political parties, socio-economic problems and foreign policies of selected states north and south of the Sahara.  
Prof. Goldman

**22.231 International Organization**

(Prereq. 22.221) 4 Cl.; 4 Q.H.

Development of international organization with special emphasis on the United Nations system.  
Prof. Jones

**22.233 International Law**

(Prereq. 22.221) 4 Cl.; 4 Q.H.

Territory and jurisdiction of states; treaties; recognition; peaceful settlement of disputes; resort to force.  
Prof. Wilfong

**22.240 Totalitarianism and Dictatorship**

(Prereq. 22.221) 4 Cl.; 4 Q.H.

An analysis of totalitarianism, dictatorship, and autocracy, including study of historical background, characteristics, theories of origin, nature, and significance, evaluation of techniques, ideologies (like Marxism-Leninism), policies, and institutions. Particular attention will be given to Soviet and German experience.  
Prof. Bursey

**22.242 The Politics of Revolution and Change**

(Prereq. 22.221) 4 Cl.; 4 Q.H.

An analysis of revolution and change, contemporary and historical, with attention to both theory and practice. Topics discussed include major trends in contemporary politics and society, and the relationship between political change and technological, scientific, or social change.  
Prof. Bursey

**22.243 Government and Politics of Communist China**

(Prereq. 22.221) 4 Cl.; 4 Q.H.

Government and party organization, socio-economic problems and policies, and foreign relations of Communist China. Attention is given to the influence of history and ideology as determinants of attitudes and behavior.  
Prof. Goldman

Winter Qtr.

**22.245 The Politics and Policies of Developing Nations**

(Prereq. 22.221) 4 Cl.; 4 Q.H.

A survey of recent political and related change among third world countries of Africa, Latin America and Asia. Topics included are: the heritage of colonialism and achievement of independence; the realities of cultural pluralism; revolution and political violence; institution building; political leadership

and role of ideology; political parties; military in politics; and international aspects of political modernization.  
Prof. Schmitt

**22.247 Government and Politics of Latin America** (Prereq. 22.221)

The governmental systems, political parties, socio-economic problems and foreign policies of Latin American states.  
Prof. Schmitt

**22.261 Public Administration** (Prereq. 22.102 or 22.131) 4 Cl.; 4 Q.H.

Introduction to the theory and practice of public administration with special emphasis on the generalities of institutions, processes, and behavior of bureaucratic organizations.  
Profs. Berkley and Medeiros

**22.270 Political Theory**

(Prereq. Junior Status or Consent of Instructor) 4 Cl.; 4 Q.H.

An analytic approach to the study of key political concepts, e.g., power, stability, equality, freedom, authority, obligation, etc.  
Prof. Barkley

**22.272 Selected Issues in Political Theory** (Prereq. 22.271) 4 Cl.; 4 Q.H.

Intensive examination of some dominant issues in modern political theory.  
Prof. Bursey

**22.273 Political Thought I**

4 Cl.; 4 Q.H.

An analytical and historical examination of the great political thinkers and of the main ideas in political thought from the Greeks to the Renaissance.  
Prof. Bursey

**22.274 Political Thought II**

4 Cl.; 4 Q.H.

An analytical and historical examination of the great political thinkers and of the main ideas in political thought from the Renaissance to the Twentieth Century.  
Prof. Bursey

**22.276 American Political Thought**

(Prereq. 23.211) 4 Cl.; 4 Q.H.

The contributions to political theory of the main social, economic, political, intellectual, and philosophic movements in America from the colonial period to the present.  
Prof. Barkley

**22.280 Research Methods in Political Science**

4 Cl.; 4 Q.H.

An introduction to some of the most common methods of carrying out research in the discipline of political science. Problems of theory construction, data-gathering, and a selection of analytical research tools including bibliographical aids and the computer are examined. Open only to seniors majoring in Political Science.  
Prof. Pfeiffer

**22.282 Seminar in American Government**

(Prereq. Sen. Pol. Sci. major and Consent of Instructor) 4 Cl.; 4 Q.H.

A study in depth of selected topics in American government.

Prof. Worth

**22.283 Seminar in International Relations**

(Prereq. Senior Political Science major and Consent of the Instructor.)

4 Cl.; 4 Q.H.

A study in depth of selected topics in international relations.

Prof. Wilfong

**22.284 Seminar in Comparative Politics**

(Prereq. Senior Political Science major and Consent of the Instructor.)

4 Cl.; 4 Q.H.

A study in depth of selected topics in comparative politics.

Prof. Goldman

**22.285 Senior Seminar in Political Science**

(Prereq. Student must be a major in Political Science and in his senior year.)

4 Cl.; 4 Q.H.

A study in depth of selected topics in political science.

Prof. Barkley

**22.290, 22.291 Directed Study**

4 Q.H.

Independent work under the direction of members of the Department on a chosen topic. Limited to qualified seniors majoring in Political Science with approval of Department.

Staff

**22.295, 22.296, 22.297, 22.298 Honors Program**

(each) 4 Q.H.

Staff

## History

**23.101 Western Civilization**

4 Cl.; 4 Q.H.

The major ideas and institutions of Western Civilization from ancient times to 1789.

Prof. Fullington and Staff

**23.102 Western Civilization**

4 Cl.; 4 Q.H.

A continuation of 23.101, covering the period since 1789.

Prof. Fullington and Staff

**23.109 Population in European History (Group A or B)**

4 Cl.; 4 Q.H.

An application of the principles of demography to European history from Roman times to the present with attention to the interaction of birth, death, marriage, and migration-rates with climate change, epidemic disease, war, economic developments, social upheaval, and political policy.

Prof. Post

**23.111 Ancient Greece (Group A)**

4 Cl.; 4 Q.H.

The origins and development of Greek civilization; political evolution of Hellenistic society from tribal to city-state organization; growth and application of Greek religious, political, and ethical ideas.

Prof. Fullington

**23.112 Ancient Rome (Group A)**

4 Cl.; 4 Q.H.

Roman civilization in two sequences: the rise of Roman power under the Republic, and the decline of Roman power under the Empire.

Prof. Fullington

**23.115 Medieval Europe (Group A)**

4 Cl.; 4 Q.H.

Europe from the Barbarian Invasions to the late thirteenth century; the expansion of Christianity and the institutionalization of church and papacy; the emergence of the Holy Roman Empire, England, and France as political units; social, cultural, and economic developments.

Prof. François

**23.117 The Rise of Nation States (Group A)**

4 Cl.; 4 Q.H.

The political and economic life of Europe from the thirteenth to the end of the seventeenth century; monarchy and constitutional government; the growing conflict between church and state; the growth of capitalism and international trade.

**23.118 The Renaissance and Reformation (Group A)**

4 Cl.; 4 Q.H.

European culture from the thirteenth to the seventeenth century; humanism; the rebirth of classicism in literature and the arts; the decline of the church and the rise of Protestant sects; the social and cultural consequences of the religious wars.

**23.120 Eighteenth Century Europe (Group B)**

4 Cl.; 4 Q.H.

Europe under the Old Regime; the era of intellectual change and of political and social revolutions; the rise and fall of Napoleon I.

Prof. François

**23.121 Nineteenth Century Europe (Group B)**

4 Cl.; 4 Q.H.

Europe during a century of dramatic transformation: the Industrial Revolution, the post-Napoleonic reaction, liberalism, socialism, nationalism, imperialism, and the coming of World War I.

Prof. Allen

**23.122 Europe, 1870–1921 (Group B)**

4 Cl.; 4 Q.H.

Europe from the Franco-Prussian War to the post-World War I settlement: the growing tensions and rivalries, and declining certainties of the end of the nineteenth century, the origins of World War I, the War itself, the Russian Revolution, and the peace of Paris. (Not open to students who intend to receive credit for 23.125.)

Mr. Herman

**23.123 Europe since 1921 (Group B)**

4 Cl.; 4 Q.H.

Europe from the Versailles settlement: the rise of totalitarianism, the Depression, the crises of liberalism and of the European mind, the

Appeasement Era, World War II, the Cold War, the end of colonialism, and Europe today. (Not open to students who intend to receive credit for 23.125.)

Mr. Herman

**23.125 Modern Europe (Group B)**

4 Cl.; 4 Q.H.

The coming of World War I, the rise of Communism and Fascism, the struggle for stability and social justice in the western democracies, World War II, and the Cold War. (Not open to students who intend to receive credit for 23.122 or 23.123.)

Profs. Backstrom, Allen, and Mr. Herman

**23.128 Modern France (Group B)**

4 Cl.; 4 Q.H.

A survey of the chief political, social, economic, intellectual, and cultural developments of France from the Revolution to the present.

Prof. Allen

**23.130 England to 1688 (Group A)**

4 Cl.; 4 Q.H.

Prehistoric Britain, the Anglo-Saxons, the Normans, the Plantagenets, the Tudors, and the Stuarts, with emphasis on the development of parliamentary institutions until the Glorious Revolution.

Prof. François

**23.131 England since 1688 (Group B)**

4 Cl.; 4 Q.H.

England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth century reaction and reform, the World Wars, and the rise of socialism.

Profs. Backstrom and Stembridge

**23.133 Stuart England (Group A)**

4 Cl.; 4 Q.H.

England from 1603 to 1688, with emphasis on social and economic change and the origins of modern liberalism.

Prof. Backstrom

**23.135 Victorian England (Group B)**

4 Cl.; 4 Q.H.

The economic, social, and political life of the English people during Victoria's reign.

Prof. Backstrom

**23.137 England since 1900 (Group B)**

4 Cl.; 4 Q.H.

The economic, social, and political life of the English people in the twentieth century.

Prof. Backstrom

**23.140 Imperial Russia (Group B)**

4 Cl.; 4 Q.H.

The emergence of Russia as a recognized European power; westernization and expansion in the eighteenth century; the impact of Napoleon; reform and revolution.

Prof. Fullington

- 23.141 Soviet Russia (Group B)** 4 Cl.; 4 Q.H.  
Forces molding the history of Russia since 1917; internal developments; foreign relations.  
Prof. Fullington
- 23.143 Ancient Middle East (Group D)** 4 Cl.; 4 Q.H.  
From the origins of civilization in Egypt and Mesopotamia to the break-up of the ancient world in the fourth century with emphasis on religion and culture.  
Mrs. Frothingham
- 23.144 The Middle East, 315-1800 (Group D)** 4 Cl.; 4 Q.H.  
Contacts and conflicts between East and West, emphasizing the rise and flowering of Islam.  
Mrs. Frothingham
- 23.145 The Modern Middle East (Group D)** 4 Cl.; 4 Q.H.  
The Middle East since 1800, with emphasis on the backgrounds of present problems.  
Mrs. Frothingham
- 23.147 Africa before 1850 (Group D)** 4 Cl.; 4 Q.H.  
African prehistory; the formation of premodern societies; the dynamics of Afro-European contact before 1850.  
Prof. Anderson
- 23.150 The Commonwealth Countries (Group D)** 4 Cl.; 4 Q.H.  
The evolution of the British Empire into the Commonwealth of Nations and the development of the principal Commonwealth countries (excluding Africa). Special emphasis on the history of Canada, Australia, New Zealand, and India.  
Prof. Stembridge
- 23.151 Modern Africa (Group D)** 4 Cl.; 4 Q.H.  
The European impact on Africa; the rise of African nationalism; the emergence of independent African states and the background of their present problems.  
Prof. Anderson
- 23.152 Africa: National Histories (Group D)** 4 Cl.; 4 Q.H.  
Special studies of the histories of selected African nations.  
Prof. Anderson
- 23.169 Far Eastern Civilization to 1850 (Group D)** 4 Cl.; 4 Q.H.  
Premodern histories and cultures of China, Japan, and Korea from antiquity to 1850.  
Prof. Anderson
- 23.170 Modern Far East (Group D)** 4 Cl.; 4 Q.H.  
The Far East since 1850, with emphasis on China and Japan and their relations with other nations.  
Mr. Ring



- 23.199 The Historian's Craft** 4 Cl.; 4 Q.H.  
The ways in which the historian studies the past and the nature of historical statements. Problems considered include research techniques, changing conceptions of historical knowledge, and the relationship between the historian and the society in which he works.  
Prof. Post
- 23.201 Colonial America (Group C)** 4 Cl.; 4 Q.H.  
The discovery and exploration of the New World; the settlement of the English colonies on the North American mainland; their development to 1763; and the origins of their clash with England.
- 23.210 The United States to 1865** 4 Cl.; 4 Q.H.  
The history of the American people from 1763 to 1865, with an analysis of the American Revolution and of the major political, constitutional, diplomatic, economic, and social problems of the new nation.  
Prof. Robinson and Staff
- 23.211 The United States since 1865** 4 Cl.; 4 Q.H.  
A continuation of the survey of American history with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government.  
Prof. Robinson and Staff
- 23.213 American Urban History (Group C)** 4 Cl.; 4 Q.H.  
The development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities.
- 23.215 The United States, 1781-1825 (Group C)** 4 Cl.; 4 Q.H.  
The political, economic, and psychological problems of adjustment to peace at the conclusion of the American Revolution; the development of an independent nation to 1825.
- 23.216 American Reformers and Reform Movements (Group C)** 4 Cl.; 4 Q.H.  
An analysis of American reform, especially in the nineteenth century.  
Prof. Jacobs
- 23.217 Topics in American History, 1825-1900 (Group C)** 4 Cl.; 4 Q.H.  
An intensive analysis of selected topics in nineteenth century American history.  
Prof. Campbell
- 23.220 The United States, 1890-1920 (Group C)** 4 Cl.; 4 Q.H.  
Progressivism, World War I, and the reaction of the 1920s.  
Prof. Bishop
- 23.221 The United States, 1920-1945 (Group C)** 4 Cl.; 4 Q.H.  
The Depression, the New Deal, World War II, and mid-century, emphasizing

the clash between liberalism and conservatism and the movement from isolationism to interventionism.  
Prof. Bishop

**23.222 The United States since 1945 (Group C)** 4 Cl.; 4 Q.H.

America's diverse responses to the postwar challenges of urbanization, economic change, civil rights, and Communism.

**23.241 Afro-American History (Group C)** 4 Cl.; 4 Q.H.

The history of Blacks in the English colonies and in the United States since the seventeenth century. The history of relations between White and Black Americans. The evolution of institutions and attitudes of Black Americans.

Prof. Jacobs

**23.250 American Historians (Group C)** 4 Cl.; 4 Q.H.

The literature of American history; major American writers of American history from the colonial period to the present, with emphasis on changing form and substance.

Prof. Robinson

**23.276 Latin America to 1850 (Group D)** 4 Cl.; 4 Q.H.

The fusing of the cultures of the Indian, the Iberian, and the Negro; the European and American forces which gave rise to the Latin American wars for independence; the early development of the new nations.

Prof. Bishop

**23.277 Modern Latin America (Group D)** 4 Cl.; 4 Q.H.

Latin America from the mid-nineteenth century to the present; dictatorial republics and the continuation of poverty and injustice; the struggles toward democracy, the rise of nationalism, and the threat of Communism; the relations between the United States and Latin America.

Prof. Bishop

**23.288 Seminar in Medieval History (Group A)** 4 Cl.; 4 Q.H.

Prof. François

**23.289 Seminar in European Intellectual History (Group B)** 4 Cl.; 4 Q.H.

Not open to students who received credit for 23.126.

Mr. Herman

**23.290 Seminar in Modern European History (Group B)** 4 Cl.; 4 Q.H.

Prof. François

**23.291 Seminar in American History (Group C)** 4 Cl.; 4 Q.H.

Prof. Campbell

**23.292 Seminar in Early Modern Europe (Group A)** 4 Cl.; 4 Q.H.

Prof. François

**23.295, 23.296, 23.297 Honors Program**  
Staff

(each) 4 Q.H.  
Fall, Winter, and Spring Qtrs.

**23.299 Directed Study**  
Staff

4 Q.H.  
All Quarters

## Philosophy and Religion

**26.101 Introduction to Philosophy I**

(each) 4 Cl.; 4 Q.H.

**26.102 Introduction to Philosophy II**

An examination of a few of the more persistent and compelling issues in philosophy. These courses are independent, but both emphasize philosophical thinking as an activity rather than the assimilation of an established body of facts. *26.101* includes such topics as theories of reality, theories of knowledge, and philosophical problems in religion. *26.102* includes such topics as social and political philosophy, philosophies of art and history.

Staff

*26.101*—Fall and Winter Qtrs.

*26.102*—Spring and Summer Qtrs.

**26.110 History of Ancient Philosophy**

4 Cl.; 4 Q.H.

The beginnings of Greek philosophy before the time of Socrates; emphasis upon the thought and influence of Socrates, Plato, and Aristotle; secondary attention given to the Epicureans, the Stoics, and the Neo-Platonists.

Prof. Fogg

Fall and Winter Qtrs.

**26.111 History of Modern Philosophy**

(Prereq. 26.110 or Consent of Instructor) 4 Cl.; 4 Q.H.

European philosophy from the Renaissance to the Nineteenth Century; emphasis upon Francis Bacon, Descartes, Spinoza, Locke, Berkeley, Hume, and Kant.

Prof. DeAngelis

Spring and Summer Qtrs.

**26.116 Eighteenth Century Philosophy**

(Prereq. 26.110 and 26.111 or Consent of Instructor) 4 Cl.; 4 Q.H.

Analysis of selected works of 18th Century Enlightenment philosophy. Voltaire, Montesquieu, Rousseau, the Encyclopedists, Burke, Jefferson, Franklin, and Paine are representative.

Prof. Kovaly

Spring Qtr.

**26.117 Nineteenth Century Philosophy**

(Prereq. 26.110 and 26.111 or Consent of Instructor) 4 Cl.; 4 Q.H.

Selected trends in this century, such as the development of German Idealism, Romanticism, Evolutionism, Materialism, and Positivism. Hegel, Shopenhauer, Nietzsche, Kierkegaard, and Marx are representative.

Not offered 1971-72

**26.118 Twentieth Century Philosophy**

(Prereq. 26.110 and 26.111 or Consent of Instructor) 4 Cl.; 4 Q.H.

Contemporary philosophic movements in Metaphysics and Methodology exemplified by Process Philosophy, Linguistic Analysis, Pragmatism, Phenomenology, and Existentialism.

Not offered 1971-72

**26.120 Existentialism**

(Prereq. 8 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

The influence of Kierkegaard and Nietzsche upon twentieth century Existentialism; its critique of scientific and traditional philosophy; the influence of Existentialism upon literature and theology; emphasis upon Jaspers, Heidegger, Marcel, and Sartre.

Prof. Kovaly

Not offered 1971-72

**26.121 Analytic Philosophy**

(Prereq. 8 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

The development of the analytic movement in the early works of Moore and Russell. Some treatment of Russell's Logical Atomism, the Logical Positivists, Ludwig Wittgenstein, and their widespread influence is included.

Prof. DeAngelis

Not offered 1971-72

**26.122 Rationalism**

(Prereq. 8 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

Analysis of the meaning and function of reason, the rationalism approach to philosophy, and the importance of this approach on such key issues as the nature of man, necessary truth, innate capacities, and deity.

Not offered 1971-72

**26.123 Empiricism**

(Prereq. 8 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

Some of the major philosophic views of experience. The approach to philosophy by traditional empiricists and the more recent radical empiricists. The importance of these approaches on such key issues as necessary truth, innate capacities, foundations of knowledge, and theory of meaning.

Prof. Fogg

Not offered 1971-72

**26.130 Aesthetics**

(Prereq. 8 Q.H. of Philosophy UNLESS  
REQUIRED in your major) 4 Cl.; 4 Q.H.

An analysis of the nature and meaning of aesthetic experience and the principles of art criticism. The possibility of standards in art and the relations of art to ethics, society, and religion are discussed.

All Quarters

**26.131 Social Philosophy**

4 Cl.; 4 Q.H.

Major forms of political and social organization with particular emphasis on the analysis and explanation of social change. Some attention given to the more general topic of the nature of explanation in the social sciences.

Mrs. Gordon.

Not offered 1971-72

**26.133 Philosophy of Science**

(Prereq. 4 Q.H. of Philosophy UNLESS  
REQUIRED in your major) 4 Cl.; 4 Q.H.

An examination of key concepts of science; scientific explanation, prediction, confirmation, laws, theories, and the criteria of scientific significance.

Prof. Hacker

Spring Qtr.

**26.134 Philosophy of Religion**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

Examines and evaluates such problems as arguments for and against the existence of God derived from reason and experience; analytical and psychological approaches toward religious belief; concept of immortality; nature of revelation and faith; the relation between science and religion.

Prof. Wellbank

Fall and Winter Qtrs.

**26.135 Philosophy of Man**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

An historic philosophical inquiry into different theories of man, his dimensions and characteristics, with a special interest in conceptions of the alienation of man. Selected readings include Descartes, Hobbes, Hegel, Marx, Kierkegaard, Maritain, Fromm, Marcuse, and Frankel.

Prof. Kovaly

Not offered 1971-72

**26.137 Philosophy and Literature**

4 Cl.; 4 Q.H.

Analysis of basic philosophic themes expressed in such writers as Tolstoy, Dostoevski, Thomas Mann, Sartre, Camus, Kafka, Hesse, Bellow, and others.

Prof. Kovaly

Fall and Winter Qtrs.

**26.139 Topics in the Philosophy of Logic**

(Prereq. 26.151) 4 Cl. 4 Q.H.

The philosophy of logic considered through various problem topics. Topics may include the significance of differing notational systems, primacy of first-order logics, ontological presuppositions of logics, relation between logic and language, the significance of formalism.

Mr. Marlies

Spring Qtr.

**26.150 Introduction to Logic**

4 Cl.; 4 Q.H.

Formal principles of correct and incorrect reasoning, meaning, and significance of language; practical exercises in effective argument; and recognition of common fallacies.

Prof. Hacker

All Quarters

**26.151 Symbolic Logic**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

The application of formal symbolic techniques to logic: elementary first-order deductive logic is covered; some consideration of the theory of identity, and the metatheory of first-order logic may be included.

Mr. Marlies

Fall and Winter Qtrs.

**26.152. Epistemology**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

A study of the theories of knowledge of major importance, from Plato to Austin.

Mr. Marlies

Spring Qtr.

**26.153 Metaphysics**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

A study of the central questions of metaphysics as well as a survey of the metaphysical positions of major importance.

Spring Qtr.

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**26.155 Moral Philosophy**

4 Cl.; 4 Q.H.

A critical appraisal of value and obligation, human rights, economic and criminal justice, and such issues as ethical relativity and empiricism, from the standpoint of rule-utilitarianism.

Prof. Wellbank

Fall and Winter Qtrs.

**26.174 Christian Faith and the Problem of Interpretation**

4 Cl.; 4 Q.H.

An examination of twentieth-century attempts at understanding the meaning of Christian faith. Beginning with some of the classical approaches to New Testament interpretation, the study will concentrate on issues raised by Albert Schweitzer's "Quest of the Historical Jesus", Rudolph Bultmann's "Demythologizing", and the problem of the new hermeneutics.

Mr. John

Fall and Winter Qtrs.

**26.177 Problems in the Study of Religion**

4 Cl.; 4 Q.H.

An examination and critical analysis of the major methods and definitions of religion, with emphasis on the anthropological, sociological, theological, and phenomenological means of isolating religious experience. The issues of the nature and function of religion will be discussed.

Prof. Pruett

Fall and Winter Qtrs.

**26.178 Religion in a Social Context**

4 Cl.; 4 Q.H.

An exploration of the social forms of religion in America. The structures and roles of the church, synagogue, and sect will be described and critically evaluated. In addition, emphasis will be given to their function with reference to general social structure, process, and reform.

Prof. Pruett

Spring and Summer Qtrs.

**26.180 Myths and Dreams as Religious Experience**

4 Cl.; 4 Q.H.

An inquiry into the basic dimensions of religious experience as illuminated by myths and dreams. A reading of myths from both Eastern and Western cultures in order to elucidate the world pictures they create. An attempt will be made to identify the questions of man and world to which these myths respond.

Mr. John

Fall and Winter Qtrs.

**26.185 Faith and Tradition in India**

4 Cl.; 4 Q.H.

An examination of selected historical, philosophical, and theological elements of Indian tradition, with special emphasis on post-Buddhist periods. The influence of Indian thought in the Far East will be examined and the influence of British Western civilization on Indian culture.

Not offered 1971-72

**26.190, 26.191, 26.192—Honors Program**

(each) 4 Q.H.

Staff

All Quarters

**26.200 Area Course: Philosophy of History**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

The nature and problem of historical explanation; the function of value judgments and myth in such explanation; discussion of the Christian, Marxist, and Idealistic interpretations of history.

Not offered 1971-72

**26.201 Area Course: Mind and Language**

(Prereq. 4 Q.H. of Philosophy or Consent of Instructor)

Contemporary challenges to mind-body dualism by linguistic philosophers with emphasis upon their analyses of such concepts as intelligence, consciousness, will, and rationality. Recent views concerning the effects of language on thought, perception, and world-views will also be discussed.

Prof. DeAngelis

Fall and Winter Qtrs.

**26.234 Advanced Course: Philosophy of Religion**

(Prereq. 26.134 or Consent of Instructor) 4 Cl.; 4 Q.H.

A consideration of such problems as the nature of religious language and symbols, psychology and religion, existentialism and theology, modern trends in theology; readings in the works of contemporary theologians and philosophers whose writings deal with these topics.

Prof. Pruett

Not offered 1971-72

**26.251 Intermediate Logic**

(Prereq. 26.151) 4 Cl.; 4 Q.H.

First-order deductive logic viewed as a formal system; important meta-theorems, including deduction theorems, completeness and soundness (consistency) proof, compactness, Lowenheim-Skolem Theorem, and results concerning decidability.

Mr. Marlies

Not offered 1971-72

**26.255 Contemporary Moral Philosophy**

(Prereq. 26.155 or Consent of Instructor) 4 Cl.; 4 Q.H.

An extensive appraisal of the cognitivist-non-cognitivist controversy in recent meta-ethics. Intensive analysis of the concepts of social justice, law, equality, distributive and retributive justice.

Prof. Wellbank

Not offered 1971-72

**26.266 Seminar in John Dewey**

(Prereq. 8 Q.H. of Philosophy or Consent of Instructor) 4 Cl.; 4 Q.H.

Prof. Hacker

Fall and Winter Qtrs.

**26.267 Seminar in Nietzsche**

(Prereq. 8 Q.H. of Philosophy or Consent of Instructor)

Prof. Fogg

Spring Qtr.

**26.273 Religion and Culture of Asia**

(Prereq. 26.180 or Consent of Instructor) 4 Cl.; 4 Q.H.)

Selected themes drawn from religious, philosophical, and literary resources of India, China, and Japan. Choice of one topic out of themes such as: "The Gods of the Hindus", "Interpretation of the Vedas and Upanishads", "The World of the I-Ching", "The Enlightenment of the Buddha", "Confucius and Lao Tzu", and "The Way of Zen."

Mr. John

Spring and Summer Qtrs.

**26.275 Contemporary Religious Issues in the Western World**

(Prereq. 26.174 or Consent of Instructor) 4 Cl.; 4 Q.H.

An analysis of some of the major developments in Christianity and Judaism in the context of industrialization and urbanization. An exploration of the im-



part of secularism upon the religions of the West as evident in Neo-Orthodoxy, Bonhoeffer's "Religionless Christianity", the radical theology of the Death of God, and the trends toward a new humanism.

Mr. John

Spring and Summer Qtrs.

### 26.276 Mysticism: East and West

(Prereq. 26.117, 26.180, or Consent of Instructor) 4 Cl.; 4 Q.H.

An inquiry into mystical experience through a comparative study of the writings of Christian, Buddhist, and Hindu mystics, and secondary interpretive sources. Questions taken up are: (1) The potential oneness of man and God, (2) The conflict of mystics with traditional forms of religion, (3) The possibility of a common cross-cultural basis for mysticism.

Prof. Pruett

Fall and Winter Qtrs.

### 26.279 Issues in Contemporary Islam

(Prereq. 26.117, 26.180, or Consent of Instructor) 4 Cl.; 4 Q.H.

A discussion of such issues in twentieth-century Islam as: (1) Pan-Islamic movements, (2) Relations with Israel and the West, (3) The Quran as lawbook, (4) Social change in modern Islamic countries through Western influence, (5) Variation on the theme of Islam in Africa, Turkey, and Iran, (6) The Muslim view of history.

Prof. Pruett

Spring Qtr.

## Art

### 27.113 Creative Drawing

4 Cl.; 4 Q.H.

Creative drawing problems in pen and ink, pencil and crayon with emphasis on form and texture; problems in illustration.

Prof. Wells and Mr. Bishop

Fall and Winter Qtrs.

### 27.114 Theory of Color and Design

4 Cl.; 4 Q.H.

Techniques and theories of design and color in painting.

Mr. Bishop

Spring Qtr.

### 27.116 History and Technique of Film Art I

4 Cl.; 4 Q.H.

A history of the development of film art from the late 19th century to the 1930s. Selected films will be viewed and studied.

Mr. Bishop

Fall and Winter Qtrs.

### 27.117 History and Technique of Film Art II

4 Cl.; 4 Q.H.

A history of the development of film art from the 1930s to the present. Selected films will be viewed and studied.

Mr. Bishop

Spring and Summer Qtrs.

### 27.118 History of Art I

4 Cl.; 4 Q.H.

A survey of western art from prehistoric times to Renaissance.

Profs. Davis, Havens

Fall and Winter Qtrs.



- 27.119 History of Art II** (Prereq. 27.118) 4 Cl.; 4 Q.H.  
A survey of western art from the Renaissance to the 20th century.  
Profs. Havens, Wells Spring and Summer Qtrs.
- 27.131 Ancient Painting and Sculpture I** 4 Cl.; 4 Q.H.  
A concentrated study of art from prehistoric times to Greek civilization.  
This course includes Egyptian art, Mesopotamian art and Aegean art.  
Prof. Davis Fall and Winter Qtrs.
- 27.133 Italian Renaissance Art I** 4 Cl.; 4 Q.H.  
Italian painting, sculpture and architecture of the 14th and 15th centuries.  
Prof. Serenyi Fall Qtr.
- 27.134 Byzantine Art** 4 Cl.; 4 Q.H.  
Byzantine Art from the 4th century through the middle of the 15th century.  
Not offered 1971-72
- 27.135 African Art** 4 Cl.; 4 Q.H.  
The stylistic characteristics of the various arts of African nations.  
Prof. Havens Fall and Spring Qtrs.
- 27.136 Ancient Painting and Sculpture II** 4 Cl.; 4 Q.H.  
A concentrated study of Greek and Roman art.  
Prof. Davis Spring Qtr.
- 27.137 Late Nineteenth-Century Painting** 4 Cl.; 4 Q.H.  
Romantic painting of France, England and Germany.  
Prof. Wells Not offered 1971-72
- 27.139 Medieval Painting and Sculpturing** 4 Cl.; 4 Q.H.  
Romanesque and Gothic painting and sculpture from the 10th century to the 15th century.  
Prof. Davis Spring Qtr.
- 27.141 Renaissance and Baroque Painting** 4 Cl.; 4 Q.H.  
Flemish, German, Dutch, French and Spanish painting of the 16th and 17th centuries.  
Prof. Wells Winter Qtr.
- 27.142 Spanish Art** 4 Cl.; 4 Q.H.  
Spanish art from the Renaissance to the 19th century.  
Prof. Wells Not offered 1971-72
- 27.143 Latin American Art** 4 Cl.; 4 Q.H.  
A concentrated study of Pre-Columbian art from the Archaic and Classical periods to the present.  
Prof. Davis Fall and Spring Qtrs.

- 27.144 English Art** 4 Cl.; 4 Q.H.  
English art from the Middle Ages to the 20th century.  
Prof. Wells Not offered 1971-72
- 27.145 French Art** 4 Cl.; 4 Q.H.  
French painting, sculpture and architecture from the Renaissance to the middle of the 19th century.  
Prof. Serenyi Spring Qtr.
- 27.146 Russian Art I** 4 Cl.; 4 Q.H.  
Art in Russia from the period of Conversion through the period of Peter the Great.  
Not offered 1971-72
- 27.147 Russian Art II** 4 Cl.; 4 Q.H.  
Art in Russia from the period of Catherine the Great to the modern concepts of Socialist Realism.  
Not offered 1971-72
- 27.148 European Graphic Arts** 4 Cl.; 4 Q.H.  
The history of graphic arts from the Medieval period to the end of the 19th century. The development of engraving, woodcutting, etching, aquatint, and lithography and the work of representative arts.  
Prof. Wells Not offered 1971-72
- 27.149 American Graphic Arts** 4 Cl.; 4 Q.H.  
Development of the Graphic Arts in America from the Colonial times to the present as shown through the works of representative artists.  
Prof. Holden Not offered 1971-72
- 27.150 History of Photography** 4 Cl.; 4 Q.H.  
A concentrated study of the development of photography with special emphasis on American photographic art to the present.  
Prof. Holden Spring Qtr.
- 27.151 Modern Painting**  
Painting from late 19th century to the present.  
Prof. Wells Fall, Spring and Summer Qtrs.
- 27.154 Italian Renaissance Art II** 4 Cl.; 4 Q.H.  
Italian painting, sculpture and architecture of the 16th and 17th centuries.  
Prof. Serenyi Winter Qtr.
- 27.161 American Art I** 4 Cl.; 4 Q.H.  
Development of American architecture, sculpture and painting from Colonial times.  
Prof. Holden Fall and Winter Qtrs.

- 27.162 American Art II** 4 Cl.; 4 Q.H.  
American architecture, sculpture and painting from 1860 to the present.  
Prof. Holden Spring Qtr.
- 27.171 Ancient Architecture** 4 Cl.; 4 Q.H.  
The architecture of Egypt, Greece and Rome.  
Prof. Serenyi Spring Qtr.
- 27.172 Medieval and Renaissance Architecture** 4 Cl.; 4 Q.H.  
Romanesque, Gothic and Renaissance architecture.  
Prof. Serenyi Not offered 1971-72
- 27.173 Modern Architecture I** 4 Cl.; 4 Q.H.  
Major architectural movements in the 20th century.  
Prof. Serenyi Fall Qtr.
- 27.174 Modern Architecture II** 4 Cl.; 4 Q.H.  
The major architects of the 20th century.  
Prof. Serenyi Fall and Winter Qtrs.
- 27.175 Late 19th Century American Architecture** 4 Cl.; 4 Q.H.  
A survey of the Stick and Shingle Architectural Styles, as well as more general developments. Introductory lectures will be followed by student presentations on selected topics.  
Prof. Holden Fall and Winter Qtrs.
- 27.181 Oriental Art I** 4 Cl.; 4 Q.H.  
The prehistoric arts of India, China, and Japan; the rise and spread of international Buddhist art; the national Indian styles of sculpture, architecture, and painting.  
Prof. Havens Fall and Winter Qtrs.
- 27.182 Oriental Art II** 4 Cl.; 4 Q.H.  
National styles of painting, sculpture, architecture, ceramics and print-making in China, Korea, and Japan.  
Prof. Havens Spring Qtr.

## Music

- 28.100 Music** 4 Cl.; 4 Q.H.  
Emphasizes specifically the techniques of listening: instrumental and vocal tone color, melodic contour, rhythmic pattern, compositional design and style, harmony, etc. *This course may serve either as preparation for general listening or for other music courses.*

- 28.102 Music Fundamentals** 4 Cl.; 4 Q.H.  
Stresses the development of primary melodic, rhythmic, harmonic and contrapuntal concepts through sight singing, ear training, etc., and culminates in the creative application of materials.
- 28.103 Music Form** 4 Cl.; 4 Q.H.  
The major forms including fugue, rondo, sonata form, theme and variations. Includes analysis of symphonic works, chamber works, and musical works using texts.
- 28.105 Music Composition** (preparation, 28.106, 28.102, 28.100) 4 Cl.; 4 Q.H.  
(limited to seminar size; approval by the instructor)  
Begins with an analysis of Trouvere songs and continues with experiments in writing modal melodies and songs. In addition, students write practical rounds, part songs, and other pieces with canonic structure. All creative essays in composition are encouraged.
- 28.106 Theory I, Tonal Techniques A** 4 Cl.; 4 Q.H.  
Essentials of tonal technique: fundamentals, ear training, sight singing, dictation, keyboard harmony, score reading, and analysis.
- 28.107 Theory II, Tonal Techniques B** (Preparation, 28.106, 28.102, 28.100) 4 Cl.; 4 Q.H.  
Advanced ear training, sight singing, dictation, keyboard harmony, score reading, and analysis; harmonic principles of chords and their inversions.
- 28.108 Contrapuntal Techniques I—16th Century Counterpoint** 4 Cl.; 4 Q.H.  
Sight singing, ear training, score reading, and composition in period forms.
- 28.109 Contrapuntal Techniques II—18th Century Counterpoint** (preparation, 28.108, 28.102, 28.100) 4 Cl.; 4 Q.H.  
Sight singing, ear training, score reading, and composition in period forms.
- 28.112 Music of the Baroque** 4 Cl.; 4 Q.H.  
The evolution of opera, oratorio, cantata and concerto in the works of such composers as Monteverdi, Corelli, Handel, Vivaldi, and Bach.
- 28.113 Bach** 4 Cl.; 4 Q.H.  
The music of J. S. Bach and of the era which produced him. Both the church works and the secular works will be studied.
- 28.115 Music of the Classical Era** 4 Cl.; 4 Q.H.  
The period of music history between Bach and Beethoven during which the symphony and the solo concerto ended. Aspects of "classical" style in instrumental and vocal works are discussed. Emphasis is placed on the music of Mozart and Haydn.  
Prof. Nadeau Spring and Summer Qtrs.
- 28.116 Great Literature for Keyboard Instruments** 4 Cl.; 4 Q.H.  
The study of pianoforte music written in the 19th and early 20th centuries

by masters such as Beethoven, Chopin, Schumann, Liszt, Debussy, and Ravel. The course will analyze the source of power and expressiveness generated in the sonatas and concerti of Beethoven; nocturnes and ballades of Chopin; and preludes of Debussy.

**28.117 Medieval and Renaissance Music** 4 Cl.; 4 Q.H.

The development of sacred and secular monody and of polyphonic music from its beginning to about 1600.

**28.119 Since Webern: The Avant Garde** 4 Cl.; 4 Q.H.

The avant grade in music: total serialism, musique concrete, electronic music, chance music. The avant garde in Jazz, Folk, Rock, and Pop.

**28.120 Survey of Music History** 4 Cl.; 4 Q.H.

An inclusive study of the men, ideas and events that have shaped music history from ancient times through the Renaissance, Baroque, Classical, and Romantic eras to our own time. Among the composers whose works are studied are Josquin, Bach, Mozart, Beethoven, Wagner, Mahler, and Stravinsky.

**28.121 Analytical Studies in the History of Music** 4 Cl.; 4 Q.H.  
(preparation, 28.120, 28.100)

Limited enrollment seminars which carry out in-depth analyses of selected, significant topics in the history of music.

**28.123 Traditional Folk Music of the World** 4 Cl.; 4 Q.H.

Identities and contrasts in the music of the collective mass, songs and dances from Europe, Russia, North and South America.

**28.124 Traditional Folk Music of the Western World** 4 Cl.; 4 Q.H.

Identities and contrasts in the music of the collective mass, songs and dances from Europe, Russia, North and South America.

**28.125 Great Choral Literature** 4 Cl.; 4 Q.H.

Analysis of choral literature by masters from Palestrina to Stravinsky. Oratorio, cantata, mass, requiem mass; smaller masterpieces.

**28.126 Music as the Expression of Man**

A general and philosophical view of music in Western culture, the following will be central to the course:

1. Aspects of social relevance
2. Compositional style in various periods.
3. Important themes, (war and peace, love and rejection, etc.) examined in a musical context. When pertinent, related concepts from the fine arts and from philosophy will be explored. Live performance, recordings, and audio-visual media will be used.

**28.135 Music of USA** 4 Cl.; 4 Q.H.

American music from Colonial times to the present. Concert music as well as folk music of ethnic origin, and music of the theater are discussed.

**28.138 Nationalism in Music**

4 Cl.; 4 Q.H.

This course is concerned with the phenomenon of national schools of music. The cultural (political and folk) dances that produce national schools and the stylistic elements of such schools are considered. Among the composers studied are, Sibelius of Finland, the "Five" of Russia, Bartok of Hungary, Ives of the United States.

**28.140 Mozart**

4 Cl.; 4 Q.H.

A musical development from child prodigy to mature artist is carefully traced from his own letters and from biographies. Many of his major works, including opera, symphonies, concertos, and chamber works are analyzed in detail.

**28.141 20th Century Music: Debussy to Bartok**

4 Cl.; 4 Q.H.

The developments in music from 1900 to mid-century. Impressionism, Expressionism, Neo-Classicism, Post-Romanticism and Neo-Nationalism.

**28.142 Stravinsky**

4 Cl.; 4 Q.H.

The life and work of this major composer. Many of his works, for example, *Le Sacre*, *Petrouchka*, *Symphony of Psalms*, and more recent works are given detailed attention. His contributions to twentieth century style, neo-classicism, pan-diatonicism, additive style, are analyzed and his strong influence on other composers is noted.

**28.143 The Music of France**

4 Cl.; 4 Q.H.

The works and styles of French composers from Lully to Boulez. Special attention is paid to several figures like Berlioz and Debussy. Orchestral and operatic music is included in the course.

**28.145 Beethoven**

4 Cl.; 4 Q.H.

An analysis of the complex personality and art of this major figure. His relation to the turbulent times in which he lived, his role in classical and romantic music.

**28.146 Music of Germany**

4 Cl.; 4 Q.H.

The works and styles of German composers from Schutz to Henze. Special attention is paid to several figures like Beethoven and Wagner. Orchestral and operatic music is included in this course.

**28.160 The Symphony**

4 Cl.; 4 Q.H.

A study of the symphony as the major genre in the Classical, Romantic, and Contemporary periods. Works by Haydn, Mozart, Beethoven, Schumann, Tschai-kovsky, Brahms, Sibelius, and Prokofief and others are studied.

**28.170 Chamber Music**

4 Cl.; 4 Q.H.

Ensemble pieces for small groups. Examples for analysis are selected from all periods from the Baroque to the present.

**28.180 Introduction to Opera**

4 Cl.; 4 Q.H.

Analysis of opera as a dramatic form. Aria, Recitative, Ensemble and other

basic elements of opera are isolated and discussed. Opera, Numbers Opera, Music Drama, Singspiel are some of the types of opera considered. Composers whose work are analyzed include, Mozart, Wagner, Verdi, and Puccini.

**28.181 Contemporary Opera**

4 Cl.; 4 Q.H.

Almost every major composer including Schoenberg, Berg, Bartok, Stravinsky, Hindemith, and Poulenc have contributed to the opera repertory, thus illustrating just about every major 20th century style. Among the works studied are *Wozzeck*, *The Rake's Progress*, *Dialogue of the Carmelites*, and *Bluebeard's Castle*.

**28.182 Wagner's Ring Cycle**

4 Cl.; 4 Q.H.

An in-depth study of Wagner's Cycle of music drama: *Das Rheingold*, *Walkure*, *Siegfried*, *Gotterdamerung*.

**28.190 The Concerto**

4 Cl.; 4 Q.H.

The concerto is studied from its origins in the Baroque era to its use in our own time. Concerti grosso as well as solo works for various instruments are studied in detail.

**28.200 Jazz**

4 Cl.; 4 Q.H.

Traces the history of jazz from its origins in New Orleans to the avant garde experiments of today. The rhythmic, harmonic, instrumental, and stylistic characteristics of jazz are analyzed. Attention is given to the work of creative jazz artists like Louis Armstrong, Charles Parker, and Duke Ellington.

**28.202 Black Artist in Music**

4 Cl.; 4 Q.H.

A study of the contributions of black composers and black performers to the world of music.

**28.220 Music Criticism and Aesthetics**

4 Cl.; 4 Q.H.

Examines major critical and philosophical views regarding the art of music. Traditional concepts regarding the relationship of form to content and communication.

## Drama and Speech

**29.100 Public Speaking**

3 Cl.; 3 Q.H.

Basic principles and techniques of effective modern speaking; emphasis on conversational delivery and clear, concise composition through group procedures, impromptu speaking, and the handling of short expository forms.  
Staff All Quarters

**29.101 Public Speaking**

(Prereq. 29.100) 3 Cl.; 3 Q.H.

Speech patterns which involve effective discussion; analysis, evidence, and reasoning as factors in convincing and persuading people.  
Staff All Quarters

- 29.102 Effective Speaking** 3 Cl.; 3 Q.H.  
 The study of verbal and non-verbal features of communicative and expressive utterance. Consideration of principles and methods of effective communication in the preparation and delivery of various types of speeches.  
 Staff All Quarters
- 29.105 Argumentation and Debate**  
 (Prereq. 29.100 or 29.102 or by permission of instructor) 4 Cl.; 4 Q.H.  
 Argumentation and debate presented as techniques of a free society, bringing reasoned discourse to bear on personal and social problems for purposes of decision and action, with attention being given to the various forms of debating techniques.  
 Prof. Woodnick Fall and Winter Qtrs.
- 29.106 Speech Fundamentals** 3 Cl.; 3 Q.H.  
 Basic principles and techniques of effective modern speaking. Examining individual voice and articulation problems. Studying and applying basic techniques of oral interpretation.  
 Staff Fall and Winter Qtrs.
- 29.107 Interpersonal Communications** 4 Cl.; 4 Q.H.  
 The achieving of greater understanding of communication behaviors and the establishing of the potential for improved communication capabilities in face-to-face interactions with people.  
 Prof. Woodnick, Miss Rothbard Fall and Winter Qtrs.
- 29.108 Business and Professional Speaking** 4 Cl.; 4 Q.H.  
 Designed for the individual business man and student seeking the business field, Business and Professional Speaking offers practice in oral presentations, group communication, conference and discussion techniques, interview methods and occasion speaking. The course combines performance aspects as well as case study methods of communication on the professional level.  
 Profs. Woodnick and Eastman Spring and Summer Qtrs.
- 29.109 Speech for the Theatre** (Prereq. 29.110) 4 Cl.; 4 Q.H.  
 Special speech problems confronting actors performing in classical and contemporary theatre.  
 Mrs. Littlefield Winter Qtr.
- 29.110 Voice and Articulation** 4 Cl.; 4 Q.H.  
 Anatomy and physiology of the vocal mechanism; properly controlled breathing for phonation; resonance and articulation; correction of individual voice and articulation problems.  
 Profs. Woodnick, Eastman, and Mrs. Littlefield All Quarters
- 29.111 Oral Interpretation**  
 (Prereq. 29.110 or by permission of instructor) 4 Cl.; 4 Q.H.  
 Application of basic vocal techniques to the dramatic reading of prose,



poetry, and drama. Through literary analysis the author's meaning is understood; and by means of oral reading skills, communicated to an audience.  
 Prof. Eastman Fall and Winter Qtrs.

**29.112 Advanced Voice and Articulation**

(Prereq. 29.110 or by permission of instructor) 4 Cl.; 4 Q.H.

Development and application of vocal technique acquired in 29.110. Emphasis on vocal analysis, flexibility, regional patterns of speech.  
 Prof. Woodnick Spring and Summer Qtrs.

**29.113 Effective Speaking Workshop**

2 Cl.; 1 Q.H.

Communication through individual speaking and in small group conferences.  
 Staff All Quarters

**29.114 Advanced Oral Interpretation**

(Prereq. 29.111) 4 Cl.; 4 Q.H.

Further development of oral reading skills acquired in 29.111. In addition, the course includes work with accents and dialects, the study of reader's theatre, and an investigation of classical and modern philosophies of the art.  
 Prof. Eastman Spring and Summer Qtrs.

**29.115 Theories of Persuasion**

4 Cl.; 4 Q.H.

Persuasive discourse as it affects and refutes the process of dynamic social change; approaching critically the theories of persuasion derived from historical, philosophical and psychological sources and their application to contemporary problems of politicking, mass media, advertising as it influences attitude, opinion and action.  
 Miss Rothbard Fall and Winter Qtrs.

**29.116 Persuasive Techniques**

(Prereq. 29.115)

4 Cl.; 4 Q.H.

A critical study of the application of the principles of persuasion to preparation and delivery of speeches and to critical analysis of modes of persuasion in representative speeches.  
 Miss Rothbard Spring Qtr.

**29.120 Introduction to Theatre Arts**

4 Cl.; 4 Q.H.

A brief view of the historical development of acting, directing, and production design; emphasis on appreciation of contemporary theatrical forms.  
 Staff Fall and Winter Qtrs.

**29.121 Survey of the Theatre I**

4 Cl.; 4 Q.H.

Introduction to the drama as a dynamic medium of human expression: historical development of the theatrical form; reading and analysis of selected plays as they relate to form, genre, style, from the point of view of audience and artist.  
 Prof. Blackman Fall and Winter Qtrs.

**29.122 Survey of the Theatre II**

4 Cl.; 4 Q.H.

Introduction to the theatre as a collaborative art form (theoretical and prac-

tical) with an emphasis upon acting, directing, design, lighting and the necessities of theatre economics.

Messrs. Buglio and Bailey

Winter and Spring Qtrs.

### 29.130 Makeup

4 Cl.; 4 Q.H.

The principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. The practical application of types and styles of makeup.

Mr. Buglio

Winter Qtr.

### 29.150 Elementary Acting I

4 Cl.; 4 Q.H.

For drama majors only or by permission of instructor. Fundamental techniques of stage use; the actor and his stage environment; improvisations for strengthening imagination and increasing freedom; analysis of scripts for work on performed scenes.

Prof. Kaplan

Fall and Winter Qtrs.

### 29.151 Elementary Acting II

(Prereq. 29.150) 4 Cl.; 4 Q.H.

Fundamental analysis of the script including physicalizations and vocal scoring; character analysis; scenes performed for classroom analysis.

Prof. Kaplan

Winter and Spring Qtrs.

### 29.152 Intermediate Acting III

(Prereq. 29.151) 4 Cl.; 4 Q.H.

Further development of the actor's tools; script and character scoring; exercises for physical and psychological freedom; in class scenes as works in progress.

Prof. Kaplan

Spring Qtr.

### 29.156 Stage and Body Movement I

4 Cl.; 4 Q.H.

For drama majors only or by permission of instructor. The movement and control of the actor's body as a means for theatrical hieroglyphics.

### 29.160 Concepts of Direction

4 Cl.; 4 Q.H.

For drama majors only or by permission of instructor. The theories of dramatic presentation through analysis of selected historical directorial developments; purposes and techniques of theatrical direction as they relate to script analysis, production style, pictorial composition, rhythmic evolution, emphatic responses.

Prof. Blackman

Winter Qtr.

### 29.161 Problems in Direction

(Prereq. 29.160) 4 Cl.; 4 Q.H.

Experimentation of theory related to the staging of classical and modern drama; analysis of plays for actual production; casting; rehearsals; character interpretations. Each student is responsible for the production of a one-act play.

Prof. Blackman

Spring Qtr.

### 29.162 Elements of Play Production

4 Cl.; 4 Q.H.

Coordinating the work of the production and business staffs; the functions

of the stage manager, business manager, and subordinate departmental heads; their relationship with associates; the conduct of production preparations, rehearsals and performance.

Not offered 1971-72

**29.163 Workshop in Play Production**

4 Cl.; 4 Q.H.

A course for the recreation teacher and leader in school, camp, settlement house, playground to train him in the selection, planning, and organization of both informal and formal dramatics activities.

Prof. Blumsack

Fall and Winter Qtrs.

**29.166 Shakespearean Production**

(Prereq. a course in Shakespeare and 29.161) 4 Cl.; 4 Q.H.

A detailed analysis of three types of Shakespearean plays—the tragedy (the tragedy of blood), the comedy, the history—with the aims of discovering the production values and of determining the production methods to mount the types successfully in the modern theatre.

Not offered 1971-72

**29.170 Scenic Production**

4 Cl.; 4 Q.H.

Principles which underlie scenic coordination and development; basic propositions governing techniques of dramatic architecture; production materials; color and light.

Mr. Bailey

Winter and Spring Qtrs.

**29.171 Design and Lighting**

(Prereq. 29.170) 4 Cl.; 4 Q.H.

The basic principles of design and lighting for the stage; historical analysis of composition and design from classical to modern periods; execution of designs for productions.

Mr. Bailey

**29.175 Costuming for the Stage**

4 Cl.; 4 Q.H.

The theoretical and practical aspects of costuming are covered through a combined lecture/laboratory format. Basic design concepts, techniques of rendering costume plates, pattern drafting, draping, fabric usage, and special effects are discussed. Particular emphasis is given to problems of costuming for the high school and college theatres.

Mr. Buglio

Fall Qtr.

**29.176 Historic Costume and Design**

(Prereq. 29.175) 4 Cl.; 4 Q.H.

A survey of historic costume and civil dress through the ages of Western man, its adaptation and relevance to the problems involved in designing for the high school and college stages is the foundation for this area of study. Emphasis is on the use of research sources for design assignments within the various periods.

Mr. Buglio

Spring Qtr.

**29.180 Playwriting**

4 Cl.; 4 Q.H.

The principles and practices of modern dramatic composition: characteriza-

tion, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play; the writing of brief scenes; the dramatic; and the one-act play.

Prof. Phillips

Fall and Winter Qtrs.

### 29.181 Playwriting

(Prereq. 29.180 or permission) 4 Cl.; 4 Q.H.

A continuation of 29.180. The writing of the longer plays. Each student will be required to submit the equivalent of a full-length play.

Prof. Phillips

Not offered 1971-72

### 29.185 Children's Theatre

4 Cl.; 4 Q.H.

Theories and methods of relating creative techniques to work with children's programs in schools, churches, and recreational facilities; analysis of literature in preparation for production of plays for children.

Prof. Blackman

Spring and Summer Qtrs.

### 29.186 Educational Theatre

4 Cl.; 4 Q.H.

Drama and drama activities in community, social, health, and educational agencies. Organizing and directing young people's theatre programs.

Prof. Blackman

Not offered 1971-72

### 29.200 History of the Theatre

4 Cl.; 4 Q.H.

Development of the theatre and the drama of Greece and Rome, medieval Europe, Elizabethan and Restoration England, and 17th century France; an examination of play-writing, acting styles, scene design, theatre architecture, and the relationship among these elements.

Prof. Phillips

Fall and Winter Qtrs.

### 29.201 History of the Theatre

4 Cl.; 4 Q.H.

Development of the European theatre of the 18th, 19th, and early 20th centuries; growth and development of the proscenium theatre; the emphasis upon naturalistic and realistic presentation; the theatre innovations.

Prof. Phillips

Spring and Summer Qtrs.

### 29.202 The Classic Theatre of Greece and Rome

4 Cl.; 4 Q.H.

The beginnings of theatre and its growth as a potent institution and as an art form. A detailed study of the interrelation of the dramatic form and the theatre structure and the works of the major playwrights.

Not offered 1971-72

### 29.205 The Restoration Theatre

4 Cl.; 4 Q.H.

The philosophical, social, historical, critical influences upon the Restoration Theatre and its dramatists.

Not offered 1971-72

### 29.210 The American Theatre

4 Cl.; 4 Q.H.

The American theatre from the Revolutionary War to the present.

Prof. Phillips

Fall and Winter Qtrs.

- 29.211 The Theatre of Williams, Miller, and Albee** 4 Cl.; 4 Q.H.  
 The American playwright reflecting the current social, philosophical, psychological dilemma.  
 Prof. Phillips Spring and Summer Qtrs.
- 29.230 Contemporary Theatre** 4 Cl.; 4 Cr.  
 The traditional and contemporary forces that shape the trends in present day theatre. Emphasis upon the works and contributions of Wilder, Pirandello, Brecht, Bolt, Ghelderode, Ionesco, Osborne, Pinter, the major absurdist, and the present experimentalists.  
 Prof. Kaplan Fall and Winter Qtrs.
- 29.231 The Theatre of the Absurd** 4 Cl.; 4 Q.H.  
 The Theatre of the Absurd as a mirror of present Existentialist thinking and its effects upon the history of Western Drama.  
 Prof. Kaplan Spring and Summer Qtrs.
- 29.240 Drama Criticism** 4 Cl.; 4 Cr.  
 An examination of both the major historical statements of a theory of the drama and contemporary drama criticism as evidenced in journalistic play reviews. Students will prepare reviews of local productions.  
 Prof. Phillips Not offered 1970-71
- 29.290 Directed Study** 4 Q.H.  
 Staff All Quarters

## English

Prerequisite for all English courses is Freshman English or equivalent.

- 30.104 Advanced Expository Writing** (Prereq. 30.113 or permission) 4 Cl.; 4 Q.H.  
 A practical course in writing direct prose with clarity and precision. Includes various methods of development; diction, style, tone; the article, review, and other forms.  
 Prof. Norvish All Quarters
- 30.108 Creative Writing: Poetry** (Prereq. 30.113 or permission) 4 Cl.; 4 Q.H.  
 Practice in various forms and strategies of verse, with specific assignments in different modes; discussion and criticism of student work and selected texts.  
 Mr. DeRoche, Prof. Robbins All Quarters
- 30.109 Creative Writing: Fiction** (Prereq. 30.113 or permission) 4 Cl.; 4 Q.H.  
 Practice in the writing of fiction, including some longer forms; discussion and criticism of student work and selected texts.  
 Mr. Sandberg All Quarters

- 30.110 Literary Analysis, Poetry** 4 Cl.; 4 Q.H.  
 Close reading of selected poems, mastery of critical terms, practice in varied critical approaches to poetry. A number of critical papers will be written. Required of English majors.  
 Staff Fall and Winter Qtrs.
- 30.111 Literary Analysis, Fiction** 4 Cl.; 4 Q.H.  
 A formal study of selected novels and short stories, mastery of critical terms, practice in varied critical approaches. A number of critical papers will be written.  
 Staff Spring and Summer Qtrs.
- 30.112 Literary Analysis, Drama** 4 Cl.; 4 Q.H.  
 A formal study of selected plays, mastery of critical terms, practice in varied critical approaches. A number of critical papers will be written.  
 Staff Spring and Summer Qtrs.
- 30.113 Freshman Writing** 4 Cl.; 4 Q.H.  
 Important principles of logic and rhetoric applied to exposition and argumentation writing; review of sentence structure, punctuation, and paragraphing; extensive reading and analysis of the essay form; theme assignments.  
 Prof. Sullivan and Staff All Quarters
- 30.114 Intro. to Literature** (Prereq. 30.113) 4 Cl.; 4 Q.H.  
 An introduction to literary forms: poetry, prose, fiction, and drama. Intensive reading in various forms, and discussion of different approaches to literature.  
 Prof. Lesser and Staff All Quarters
- 30.115 Great Themes in Literature** (Prereq. 30.114) 4 Cl.; 4 Q.H.  
 Content determined by instructor, who chooses a theme and a number of books from different periods to illustrate it. Examples: The Hero in Literature; Visions of Utopia; Science Fiction, etc.  
 Prof. Lesser and Staff Winter and Spring Qtrs
- 30.120 Introduction to Linguistics** 4 Cl.; 4 Q.H.  
 Nature and origin of language; both distinctive and shared features of the Indo-European languages; general phonetics; Grimm's and Verner's laws; effects of stress; economy of effort; analogy; borrowings; etymology, etc.  
 Prof. Barrs Fall and Winter Qtrs.
- 30.121 Foundations of the English Language** 4 Cl.; 4 Q.H.  
 Development of modern English from pre-Anglo-Saxon beginnings; effects of the Scandinavian invasions and of the Norman Conquest; changes in phonology, morphology, syntax, and meanings; sources of the vocabulary; the making of words; dialectology; English as an international language; the problem of spelling.  
 Prof. Barrs Spring and Summer Qtrs.
- 30.124 Traditional Grammar** 4 Cl.; 4 Q.H.  
 A reappraisal of traditional grammar in the light of recent advances in grammatical theory; the practical application of such grammar in both

studying and teaching English as a medium of expression; supplementary readings by way of transition to the newer grammars.

Prof. Barrs

Fall and Winter Qtrs.

### 30.125 Grammars of English

4 Cl.; 4 Q.H.

An attempt to understand and apply the newer grammar, especially the structural.

Mr. Finney

Spring and Summer Qtrs.

### 30.126 Transformational Grammar

4 Cl.; 4 Q.H.

The development of the theories of generative-transformational grammars by Noam Chomsky and others and the development of the skill to construct and operate specific generative-transformational grammars.

Mr. Finney

Spring and Summer Qtrs.

### 30.130 Introduction to Semantics

4 Cl.; 4 Q.H.

The relation between language and behavior; levels of abstraction in communication; habits of evaluation of linguistic phenomena, and the modification of such habits in the direction of human understanding and survival.

Fall and Winter Qtrs.

### 30.140 The Novel of Violence

4 Cl.; 4 Q.H.

An attempt to trace the evolution of the "hard-boiled" hero in American fiction. Readings include Cooper's Leatherstocking novels, and the novels of Ernest Hemingway, Dashiell Hammett, Raymond Chandler, and Ross MacDonald.

Prof. Parker

Fall and Winter Qtrs.

### 30.141 Science Fiction

4 Cl.; 4 Q.H.

The myths and rhetorical (scientific and pseudo-scientific) strategies of science fiction from Mary Shelley's *Frankenstein* through current authors such as Vonnegut, Bradbury, Heinlein, Clarke.

Mr. Goshgarian, Miss Roth

Fall and Winter Qtrs.

### 30.142 The Psychological Novel

4 Cl.; 4 Q.H.

Concentration on twentieth-century novels whose themes stress individual behavior and motivation and whose form and style often try to imitate human mental and emotional processes (e.g., by techniques like stream-of-consciousness). Authors studied include Kafka, Dostoevski, Faulkner, Conrad, and Lawrence.

Prof. Sullivan

All Quarters

### 30.143 Autobiography and Fiction

4 Cl.; 4 Q.H.

Autobiography as the product of creative and therefore fictional impulses is studied by examining the way autobiographers shape the facts of their lives into patterns reflecting attitudes towards self. This study is extended to novels narrated by fictional self-historians.

Prof. Roemer

Fall and Winter Qtrs.



- 30.144 Literature of the Absurd** 4 Cl.; 4 Q.H.  
 The aesthetic structure and philosophical implications of such significant "absurdist" writers as Beckett, Genet, Vonnegut, Pynchon, West.  
 Prof. Kroll All Quarters
- 30.151 The Modern Novel** 4 Cl.; 4 Q.H.  
 Outstanding novels of the 20th century, with emphasis on literary trends and implied social outlook.  
 Staff Fall and Winter Qtrs.
- 30.152 Modern Drama** 4 Cl.; 4 Q.H.  
 Native and European drama since 1880, with emphasis on the relationship between drama and society in the 20th century.  
 Staff Spring and Summer Qtrs.
- 30.154 The Modern Short Story** 4 Cl.; 4 Q.H.  
 Selected British and American writers of the short story, with close attention to contemporary practitioners (Salinger, Malamud, Roth) as well as major figures (Joyce, Lawrence, Faulkner).  
 Prof. Griffin Fall and Winter Qtrs.
- 30.170 Survey of English Literature** 4 Cl.; 4 Q.H.  
 English literature to 1800.  
 Staff Fall and Winter Qtrs.
- 30.171 Survey of English Literature** 4 Cl.; 4 Q.H.  
 English literature from 1800 to the present.  
 Staff Spring and Summer Qtrs.
- 30.180 Survey of American Literature** 4 Cl.; 4 Q.H.  
 American literature to 1860.  
 Staff Spring and Summer Qtrs.
- 30.181 Survey of American Literature** 4 Cl.; 4 Q.H.  
 American literature from 1860 to the present.  
 Staff Spring and Summer Qtrs.
- 30.182 Major American Novels** 4 Cl.; 4 Q.H.  
 An intensive analysis of the themes, forms, and techniques of American novelists of the nineteenth and early twentieth centuries. Critical papers will be required.  
 Prof. Trachtenberg Fall and Winter Qtrs.
- 30.183 Major American Novels** 4 Cl.; 4 Q.H.  
 An intensive analysis of the themes, forms, and techniques of modern American novelists. Critical papers will be required.  
 Prof. Trachtenberg Spring and Summer Qtrs.



- 30.186 Early American Literature** 4 Cl.; 4 Q.H.  
 The development of early American culture of the colonial and Federal periods. Letters, narratives, verse, polemics, the Federalist Papers, etc.  
 Prof. Lesser Fall and Winter Qtrs.
- 30.187 New England Renaissance** 4 Cl.; 4 Q.H.  
 An intensive survey of Transcendentalism, and relevant works of Melville and Hawthorne.  
 Prof. Yoder Spring and Summer Qtrs.
- 30.188 American Romanticism** 4 Cl.; 4 Q.H.  
 An intensive survey of Poe, Melville, Whitman, Dickinson, and others.  
 Prof. Yoder Fall and Winter Qtrs.
- 30.189 American Realism** 4 Cl.; 4 Q.H.  
 American literature from the Civil War to Norris, Crane, Twain, and James.  
 Prof. Nagel Spring and Summer Qtrs.
- 30.190 Modern American Literature** 4 Cl.; 4 Q.H.  
 Fiction, drama, and poetry from the turn of the century to the mid-forties.  
 Fall and Winter Qtrs.
- 30.200 Western World Literature I** 4 Cl.; 4 Q.H.  
 The major literary forms of classical Greece, with special attention to the epic, drama, and dialogue. In-depth study of selected works of Homer, Plato, Aristotle and the dramatists.  
 Prof. Khiralla Fall and Winter Qtrs.
- 30.201 Western World Literature II** 4 Cl.; 4 Q.H.  
 The major literary forms of the Roman Empire, with special attention to the epic, drama, and oration. Emphasis on the works of Virgil, Horace, Ovid, and Cicero.  
 Prof. Khiralla Spring and Summer Qtrs.
- 30.202 Western World Literature III** 4 Cl.; 4 Q.H.  
 The major literary forms in the European tradition from the medieval period to the nineteenth century. Selected readings from such figures as Dante, Calderon, Milton, Racine, Corneille, Johnson, and Goethe.  
 Mr. Sands Fall and Winter Qtrs.
- 30.203 Western World Literature IV** 4 Cl.; 4 Q.H.  
 The major literary forms of the twentieth century. Readings from major American and European figures are surveyed, with special emphasis on Kafka, Camus, Sartre, Ionesco, Beckett, and Albee.  
 Mr. Sands Spring and Summer Qtrs.

**30.210 Major British Novelists**

4 Cl.; 4 Q.H.

The eighteenth-century English novel, with special attention to Defoe, Fielding, Smollett, Sterne, the Gothic novelists, and Austen; the development of the English novel and the characteristic quality of eighteenth-century fiction.

Fall and Winter Qtrs.

**30.211 Major British Novelists**

4 Cl.; 4 Q.H.

The nineteenth-century English novel, with special attention to the Brontës, Thackeray, Trollope, Eliot, Meredith, Gissing, and Hardy; the Victorian frame of mind, as seen in the novels.

Spring and Summer Qtrs.

**30.218 Medieval English Literature**

4 Cl.; 4 Q.H.

Major works in Middle English, including *Sir Gawain*, *Piers Plowman* and *Pearl*.

Prof. Blanch

Fall and Winter Qtrs.

**30.219 Major British Dramatists: Restoration & 18th Century**

4 Cl.; 4 Q.H.

Major dramatists from 1660–1800. Among those studied will be Etherege, Wycherley, Congreve, Dryden, Addison, Goldsmith and Sheridan.

Mr. Sands

Spring and Summer Qtrs.

**30.220 Major British Dramatists: Elizabethan and Jacobean**

4 Cl.; 4 Q.H.

The origins, themes, form, techniques, and poetry of such dramatists as Kyd, Webster, Tourneur, Fletcher and Beaumont, with particular emphasis on the works of Marlowe, Jonson and Ford.

Prof. Dillon

Fall and Winter Qtrs.

**30.221 Major British Dramatists: 19th Century and Modern**

4 Cl.; 4 Q.H.

British drama with particular emphasis on the poetic and experimental in the works of Shaw, Synge, Yeats, O'Casey, Eliot, Behan, Pinter and Beckett.

Prof. Bernstein

Fall and Winter Qtrs.

**30.222 Chaucer**

4 Cl.; 4 Q.H.

Chaucer's early poems and selected *Canterbury Tales*.

Prof. Blanch

Fall and Winter Qtrs.

**30.223 Chaucer**

4 Cl.; 4 Q.H.

Selected *Canterbury Tales* and portions of *Troilus*.

Prof. Blanch

Spring and Summer Qtrs.

**30.224 Spenser**

4 Cl.; 4 Q.H.

Selected early poems and portions of the *Faerie Queene*.

Mr. Blessington

Spring and Summer Qtrs.

**30.225 Milton**

Cl.; 4 Q.H.

Concentration on Milton's *Paradise Lost* with supplementary readings in his minor poems and prose.

Mr. Blessington

Fall and Winter Qtrs.

- 30.230 Seventeenth Century English Literature** 4 Cl.; 4 Q.H.  
Major writers of the first half of the century with special emphasis on Bacon, Jonson and the metaphysical poets, Donne and Herbert; the effect of science on the literature and the thinking of the times.  
Prof. Howes Fall and Winter Qtrs.
- 30.231 Seventeenth Century English Literature** 4 Cl.; 4 Q.H.  
Major writers of the second half of the century with emphasis upon Dryden and Milton. Satire as a literary genre and its relationship to the times.  
Spring and Summer Qtrs.
- 30.236 Eighteenth Century English Literature** 4 Cl.; 4 Q.H.  
Significant dramatic works of the period and the writings of Pope and Swift are treated.  
Prof. Weitzman Fall and Winter Qtrs.
- 30.237 Eighteenth Century English Literature** 4 Cl.; 4 Q.H.  
Writings of Dr. Johnson, Boswell, and Blake.  
Prof. Weitzman Spring and Summer Qtrs.
- 30.240 Nineteenth Century English Literature: The Romantics I** 4 Cl.; 4 Q.H.  
The poetry of Blake, Wordsworth, Coleridge, and related critical material; the relationship between the poetry and the time.  
Prof. Roemer Fall and Winter Qtrs.
- 30.241 Nineteenth Century English Literature: Victorian Poetry** 4 Cl.; 4 Q.H.  
The poetry of Victorian England with special emphasis upon that of Tennyson and Browning; reading of related critical material; the relationship between the poetry and the time.  
Prof. Sussman Fall and Winter Qtrs.
- 30.242 Nineteenth Century English Lit.: The Romantics II** 4 Cl.; 4 Q.H.  
The poetry of Byron, Shelley, Keats, and related critical material; essayists like Lamb, Hazlitt, and DeQuincey will also be included.  
Prof. Roemer Spring and Summer Qtrs.
- 30.243 Nineteenth Century English Lit.: Victorian Prose** 4 Cl.; 4 Q.H.  
Significant books by such authors as Carlyle, Newman, Mill, Ruskin, Arnold, Pater.  
Prof. Sussman Spring and Summer Qtrs.
- 30.246 Twentieth Century Literature** 4 Cl.; 4 Q.H.  
The modern movement in English and American literature from 1890 to 1920, against its background and its context of symbolism, naturalism, expressionism, and other related movements. Writers to be studied include H. G. Wells, Arnold Bennett, the early Yeats, the early Frost, and the Georgian and Imagist Poets.  
Prof. Roby Fall and Winter Qtrs.

- 30.247 Twentieth Century Literature** 4 Cl.; 4 Q.H.  
The modern movement in English and American literature from 1920 to the present. Writers to be studied include Hemingway, Fitzgerald, Faulkner, Yeats, Virginia Woolf, Frank O'Connor, Stevens, W. C. Williams, Auden, Thomas, the "angry generation", the "new" poets, and fiction writers since World War II.  
Prof. Roby Spring and Summer Qtrs.
- 30.248 Sixteenth Century English Literature** 4 Cl.; 4 Q.H.  
Fall and Winter Qtrs.
- 30.250 Shakespeare** 4 Cl.; 4 Q.H.  
A chronological approach to Shakespeare's plays, beginning with *Romeo and Juliet* and ending with *Julius Caesar*. Emphasis on diction, dramatic structure and psychology.  
Prof. Howes and Staff Fall and Winter Qtrs.
- 30.251 Shakespeare** 4 Cl.; 4 Q.H.  
Shakespeare's middle and last phases; *Hamlet* to *The Tempest*; selected plays.  
Prof. Howes and Staff Spring and Summer Qtrs.
- 30.260 The Bible** 4 Cl.; 4 Q.H.  
A close study and textual analysis of selected books of the Bible. The assigned texts are especially considered in their historical and literary aspects.  
Prof. Blois Spring and Summer Qtrs.
- 30.261 Mythology** 4 Cl.; 4 Q.H.  
The mythological patterning of human experience, the philological and anthropological approaches to specific myths, especially those of the Greeks, and the themes of sacrifice and change.  
Prof. Blois Fall and Winter Qtrs.
- 30.262 Literary Criticism: Classical and Romantic** 4 Cl.; 4 Q.H.  
Close reading of major critical statements, including Plato, Aristotle, Sidney, Dryden, the Neoclassical School, Wordsworth, Coleridge, Shelley, and others.  
Prof. Nelson Fall and Winter Qtrs.
- 30.263 Modern Poetry I** 4 Cl.; 4 Q.H.  
A study of the origin and development of modern poetry. Poets studied will include Hardy, Yeats, Robinson, Frost, Stevens, Moore, Eliot and Pound. Recommended for students who have already had an introductory course in poetry.  
Prof. Morse Fall and Winter Qtrs.
- 30.264 Modern Poetry II** 4 Cl.; 4 Q.H.  
A continuation of 30.263, with emphasis on the later work of Eliot and Pound, Wm. Carlos Williams, the Objectivists, the Fugitives (Ransom, Tate,

Warren), Auden, Lowell, Roethke, Dylan Thomas, and the "new poets" from 1945 to 1960.

Prof. Morse

Spring and Summer Qtrs.

**30.266 Modern Literary Criticism**

4 Cl.; 4 Q.H.

Major 19th and 20th century literary critics, from Poe and Baudelaire to Pater, Pound, Eliot and others.

Prof. Nelson

Spring and Summer Qtrs.

**30.267 Afro-American Literature**

4 Cl.; 4 Q.H.

A survey of the development and range of black American writers, emphasizing poetry and prose from the post-Civil War period to the present.

Fall and Winter Qtrs.

**30.268 Afro-American Literature**

4 Cl.; 4 Q.H.

Continuation of 30.267.

Spring and Summer Qtrs.

**30.270, 30.271 Junior Seminar**

(each) 4 Q.H.

Fall, Winter and Spring Qtrs.

**30.272 Studies in English Literature**

4 Cl.; 4 Q.H.

A seminar course on a special topic which will be announced in advance. Examples: The Pre-Raphaelites; Literature and Psychology; John Donne, etc.

Fall and Winter Qtrs.

**30.273 Studies in English Literature**

4 Cl.; 4 Q.H.

Continuation of 30.272.

Spring and Summer Qtrs.

**30.274 Studies in American Literature I**

4 Cl.; 4 Q.H.

A seminar course on a special topic to be announced in advance. Examples: Puritanism, Early Drama; The Genteel Tradition; etc.

Fall and Winter Qtrs.

**30.275 Studies in American Literature II**

4 Cl.; 4 Q.H.

Spring and Summer Qtrs.

**30.276 African Literature**

4 Cl.; 4 Q.H.

Fall and Winter Qtrs.

**30.280, 30.281 Senior Seminar**

(each) 4 Q.H.

Staff

Fall, Winter and Spring Qtrs.

**30.290, 30.291 Directed Study**

(each) 4. Q.H.

All Quarters

**30.295, 30.296 Junior Honors**

(each) 4 Q.H.

All Quarters

## French

- 31.115 Intermediate French I** (Prereq. 31.152) 4 Cl.; 4 Q.H.  
Continuation of grammar, oral practice and the reading of selected texts.  
Prof. Fabrizi and Staff
- 31.116 Intermediate French II** (Prereq. 31.115) 4 Cl.; 4 Q.H.  
Continuation of 31.115, with greater emphasis on reading.  
Prof. Fabrizi and Staff
- 31.117 French Composition and Conversation** (Prereq. 31.116) 4 Cl.; 4 Q.H.  
A course to perfect speaking and writing ability. The basis of work will be analysis of the language, oral and written reports and general discussions. Conducted in French.  
Prof. Fabrizi Fall and Winter Qtrs.
- 31.118 French Composition and Conversation** (Prereq. 31.117) 4 Cl.; 4 Q.H.  
Continuation of 31.117, with stress on individual work, free discussions and compositions. Conducted in French.  
Prof. Fabrizi Spring and Summer Qtrs.
- 31.119 French Literature of the Twentieth Century**  
(Prereq. 31.132 or 31.118) 4 Cl.; 4 Q.H.  
Narrative and dramatic prose writers prior to World War II, including Proust, Claudel, Gide and Mauriac.  
Prof. Fabrizi Fall and Winter Qtrs.
- 31.120 French Literature of the Twentieth Century**  
(Prereq. 31.119, 31.132, or 31.118) 4 Cl.; 4 Q.H.  
The prose literature of present-day France as illustrated by the works of Sartre, Camus, Ionesco and others.  
Prof. Fabrizi Spring and Summer Qtrs.
- 31.121 French Literature of the Nineteenth Century**  
(Prereq. 31.132 or 31.118) 4 Cl.; 4 Q.H.  
Romantic poetry and drama, the Realist novel.  
Prof. Stephan Offered 1972-73, Fall and Winter Qtrs.
- 31.122 French Literature of the Nineteenth Century**  
(Prereq. 31.121, 31.132, or 31.118) 4 Cl.; 4 Q.H.  
Flaubert; Parnassian and Symbolist poetry.  
Prof. Stephan Offered 1972-73, Spring and Summer Qtrs.

- 31.123 French Classicism** (Prereq. 31.132 or 31.118) 4 Cl.; 4 Q.H.  
Intellectual currents and other non-dramatic literature of the seventeenth century.  
Prof. Williams Fall and Winter Qtrs.
- 31.124 French Classicism** (Prereq. 31.123, 31.132, 31.118) 4 Cl.; 4 Q.H.  
Dramatic literature of the seventeenth century. Plays of Corneille, Molière, and Racine.  
Prof. Williams Spring and Summer Qtrs.
- 31.130 Applied French Linguistics** (Prereq. 30.120) 4 Cl.; 4 Q.H.  
For teachers or prospective teachers of French. Phonemes and allophones; breath groups and sentences; intonation patterns; comparison between oral and written French.
- 31.131 Masterpieces of French Literature I** (Prereq. 31.116) 4 Cl.; 4 Q.H.  
Introductory course in French literature. Selected works from the Middle Ages to the eighteenth century.  
Prof. Stephan and Staff Fall and Winter Qtrs.
- 31.132 Masterpieces of French Literature II** (Prereq. 31.131 or 31.116) 4 Cl.; 4 Q.H.  
Introductory course in French literature. Selected works from the nineteenth and twentieth centuries.  
Prof. Stephan and Staff Spring and Summer Qtrs.
- 31.140 Eighteenth Century French Literature** (Prereq. 31.132, or 31.118) 4 Cl.; 4 Q.H.  
The progress of the philosophical spirit and rationalistic thinking as reflected in the works of Fontenelle, Bayle, Montesquieu, Voltaire and others. Conducted in French.  
Prof. Fabrizi Offered 1972-73, Fall and Winter Qtrs.
- 31.141 Eighteenth Century French Literature** (Prereq. 31.140, 31.132, 31.118) 4 Cl.; 4 Q.H.  
The achievements of the spirit of Enlightenment and the awakening of the Romantic sensibility, as seen in such authors as Diderot, Rousseau, St. Pierre and Beaumarchais. Conducted in French.  
Prof. Fabrizi Offered 1972-73, Spring and Summer Qtrs.
- 31.151 Elementary French I** 4 Cl.; 4 Q.H.  
Essentials of grammar; practice in speaking and reading; progressive acquisition of basic language skills.  
Prof. Williams and Staff Fall and Winter Qtrs.
- 31.152 Elementary French II** (Prereq. 31.151) 4 Cl.; 4 Q.H.  
Continuation of grammar study and basic language skills; reading of French of increasing difficulty; practice in conversation.  
Prof. Williams and Staff

**31.185 Directed Study**  
Staff

4 Q.H.  
All Quarters

**31.296, 31.297, 31.298 Honors Program**  
Staff

(each) 4 Q.H.  
All Quarters

## Spanish

**32.115 Intermediate Spanish I** (Prereq. 32.152) 4 Cl.; 4 Q.H.  
Intensive grammar review; reading of modern prose and poetry, with occasional oral or written translation; basic elements of composition and conversation practice based on assigned readings.  
Prof. Modee and Staff

**32.116 Intermediate Spanish II** (Prereq. 32.115) 4 Cl.; 4 Q.H.  
Intensive reading of modern Spanish prose of moderate difficulty; further practice in composition and continued conversation practice based on assigned readings.  
Prof. Modee and Staff

**32.117 Spanish Composition and Conversation** (Prereq. 32.116) 4 Cl.; 4 Q.H.  
Practice in writing and speaking Spanish, including written and oral resúmenes, prepared speeches and themes, impromptu speaking and writing; a review of the more subtle problems of grammar.  
Prof. Jaramillo Fall and Winter Qtrs.

**32.118 Spanish Composition and Conversation** (Prereq. 32.117) 4 Cl.; 4 Q.H.  
Further practice in oral and written Spanish; continued study of problems of advanced Spanish grammar.  
Prof. Jaramillo Spring and Summer Qtrs.

**32.119 Spanish American Literature** (Prereq. 32.118 or 32.132) 4 Cl.; 4 Q.H.  
Early Latin American literature; the literature of the colonial period and the early nineteenth century based primarily on selections from an anthology.  
Prof. Jaramillo Fall and Winter Qtrs.

**32.120 Spanish American Literature** (Prereq. 32.119, 32.118 or 32.132) 4 Cl.; 4 Q.H.  
Modern Latin American literature; readings from nineteenth and twentieth century prose and poetry.  
Prof. Jaramillo Spring and Summer Qtrs.

**32.121 Spanish Literature of the Middle Ages** (Prereq. 32.118 or 32.132) 4 Cl.; 4 Q.H.



Selections from the major works of the Middle Ages, from the *Poema del Cid* to the *Libro de buen amor*.

Prof. Modee

Offered 1972-73, Fall and Winter Qtrs.

### 32.122 Spanish Literature of the 15th and 16th Centuries

(Prereq. 32.122, 32.132, or 32.118) 4 Cl.; 4 Q.H.

Selections from the major works of the fifteenth and sixteenth centuries, from *La Celestina* to Mysticism.

Prof. Modee

Offered 1972-73, Spring and Summer Qtrs.

### 32.123 Spanish Literature of the Golden Age

(Prereq. 32.132 or 32.118) 4 Cl.; 4 Q.H.

Cervantes; selections from the *Entremeses*, the *Novelas ejemplares*, and *Don Quijote*, with emphasis on the latter as Spain's greatest literary masterpiece.

Prof. Kitchin

Offered in 1971-72, Fall and Winter Qtrs.

### 32.124 Spanish Literature of the Golden Age

(Prereq. 32.123, 32.132, or 32.118) 4 Cl.; 4 Q.H.

Readings from the *comedias* of Lope de Vega. Tirso de Molina, Calderón and Ruiz de Alarcón; also prose and poetry selections of Gongora and Quevedo.

Prof. Kitchin

Offered in 1971-72, Spring and Summer Qtrs.

### 32.125 Nineteenth Century Spanish Literature

(Prereq. 32.132 or 32.118) 4 Cl.; 4 Q.H.

Readings in the prose, poetry, and drama of the romantic period, including selections from El Duque de Rivas, Larra, Espronceda, Zorrilla, and Bécquer.

Prof. Modee

Offered in 1971-72, Fall and Winter Qtrs.

### 32.126 Nineteenth Century Spanish Literature

(Prereq. 32.125, 32.132, or 32.118) 4 Cl.; 4 Q.H.

Readings of the major novels of the regional and realistic periods.

Prof. Modee

Offered in 1971-72, Spring and Summer Qtrs.

### 32.127 Twentieth Century Spanish Literature

(Prereq. 32.132, or 32.118) 4 Cl.; 4 Q.H.

Selections from the writings of the Generation of '98: Unamuno, Valle-Inclán, Río Baroja, Benavente, Azorin, and the Machado brothers.

Prof. Jaramillo

Offered 1972-73, Fall and Winter Qtrs.

### 32.128 Twentieth Century Spanish Literature

(Prereq. 32.127, 32.132, 32.118) 4 Cl.; 4 Q.H.

Prose and poetry of modern writers, such as Ortega y Gasset, Pérez de Ayala, García Lorca, Juan Ramón Jiménez, Gironella, and José Cela.

Prof. Jaramillo

Offered 1972-73, Spring and Summer Qtrs.

### 32.131 Masterpieces of Spanish Literature I

(Prereq. 32.116) 4 Cl.; 4 Q.H.

Introductory course in Spanish literature. Selected works from the Middle Ages to the *Siglo de Oro*.

Mrs. Wegmann

Fall and Winter Qtrs.

## 322 / GERMAN

### 32.132 Masterpieces of Spanish Literature II

(Prereq. 32.131 or 32.116) 4 Cl.; 4 Q.H.

Introductory course in Spanish literature. Selected works from the nineteenth and twentieth centuries.

Mrs. Wegmann

Spring and Summer Qtrs.

### 32.140 Advanced Spanish Proficiency

(Prereq. Consent of Instructor) 4 Cl.; 4 Q.H.

Designed for those preparing to enter the teaching profession, as well as qualified advanced students. Advanced elements of Spanish syntax, with emphasis upon achieving superior speaking, reading and writing skills.

Prof. Jaramillo

Fall and Winter Qtrs.

### 32.141 Advanced Spanish Proficiency

(Prereq. 32.140 or consent) 4 Cl.; 4 Q.H.

Continuation of aims and goals of 32.140.

Prof. Jaramillo

Spring and Summer Qtrs.

### 32.151 Elementary Spanish I

4 Cl.; 4 Q.H.

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

Staff

Fall and Winter Qtrs.

### 32.152 Elementary Spanish II

(Prereq. 32.151) 4 Cl.; 4 Q.H.

Continuation of grammar study. Oral and written exercises; reading of basic Spanish prose.

Staff

### 32.290 Directed Study

4 Q.H.

Staff

All Quarters

### 32.296, 32.297, 32.298 Honors Program

(each) 4 Q.H.

Staff

All Quarters

## German

### 33.115 Intermediate German I

(Prereq. 33.152) 4 Cl.; 4 Q.H.

German civilization through texts of average difficulty; review of grammar; written and oral exercises.

Miss Boehme and Staff

### 33.116 Intermediate German II

(Prereq. 33.115) 4 Cl.; 4 Q.H.

Readings from modern German prose; conversational practice.

Miss Boehme and Staff

### 33.117 German Composition and Conversation (Prereq. 33.116) 4 Cl.; 4 Q.H.

Grammar review; written work; German conversation.

Miss Boehme

Fall and Winter Qtrs.

- 33.118 German Composition and Conversation** (Prereq. 33.117) 4 Cl.; 4 Q.H.  
Free composition; oral reports; class discussions.  
Miss Boehme Spring and Summer Qtrs.
- 33.119 Scientific German** (Prereq. 33.116) 4 Cl.; 4 Q.H.  
Review of grammar; readings in scientific German: articles dealing with chemistry, physics, mathematics and biology.  
Prof. Aluf Fall and Winter Qtrs.
- 33.120 The German Lyric** (Prereq. 33.116) 4 Cl.; 4 Q.H.  
German lyric poetry from the twelfth century to the present; analysis of selected poems; reports; discussions.  
Prof. Aluf Spring and Summer Qtrs.
- 33.121 Classical Period of German Literature**  
(Prereq. 33.132 or 33.118) 4 Cl.; 4 Q.H.  
Background and general survey of the period from 1750 to 1800, with particular emphasis on the works of Lessing and Schiller.  
Prof. Cooperstein Offered every third year.
- 33.122 The Works of Goethe** (Prereq. 33.121, 33.132 or 33.118) 4 Cl.; 4 Q.H.  
Dramas, prose writings, and lyric poetry of Goethe; lectures, collateral readings; reports.  
Prof. Cooperstein Offered every third year.
- 33.123 Nineteenth Century German Literature**  
(Prereq. 33.132 or 33.118) 4 Cl.; 4 Q.H.  
Background and general survey of German literature in the nineteenth century, with particular attention to prose and lyric poetry.  
Prof. Cooperstein Offered in 1971-72, Fall and Winter Qtrs.
- 33.124 German Drama of the Nineteenth Century**  
(Prereq. 33.123, 33.132 or 33.118) 4 Cl.; 4 Q.H.  
Plays by Kleist, Hebbel, Grillparzer, and Ludwig; lectures, collateral readings, reports.  
Prof. Cooperstein Spring and Summer Qtrs.
- 33.125 German Literature of the Twentieth Century**  
(Prereq. 33.132, 33.118) 4 Cl.; 4 Q.H.  
Recent German literature, particularly prose and lyric poetry.  
Prof. Cooperstein Offered every third year.
- 33.126 German Drama of the Twentieth Century**  
(Prereq. 33.125, 33.132, or 33.118) 4 Cl.; 4 Q.H.  
Plays by Schnitzler, Hofmannsthal, Wedekind, Kaiser, Toller, Unruh, and Wiechert.  
Prof. Cooperstein Offered every third year.

- 33.131 Masterpieces of German Literature I** (Prereq. 33.116) 4 Cl.; 4 Q.H.  
 Reading of selections of German literature from the Middle Ages through the Classical period.  
 Miss Barrus Fall and Winter Qtrs.
- 33.132 Masterpieces of German Literature II**  
 (Prereq. 33.131 or 33.116) 4 Cl.; 4 Q.H.  
 Reading of selections from the major works of the Classical period through the 20th century.  
 Miss Barrus Spring and Summer Qtrs.
- 33.151 Elementary German I** 4 Cl.; 4 Q.H.  
 Essentials of grammar; practice in pronunciation; acquisition of a basic vocabulary; idiomatic expressions.  
 Prof. Aluf and Staff Fall and Winter Qtrs.
- 33.152 Elementary German II** (Prereq. 33.151) 4 Cl.; 4 Q.H.  
 More difficult points of grammar; reading of simple German prose, with oral and written exercises.  
 Prof. Aluf and Staff
- 33.290 Directed Study** 4 Q.H.  
 Staff All Quarters
- 33.296, 33.297, 33.298 Honors Program** (each) 4 Q.H.  
 Staff All Quarters

## Russian

- 34.115 Intermediate Russian I** (Prereq. 34.152) 4 Cl.; 4 Q.H.  
 Designed to further the student's knowledge of Russian through oral and written work, the study of grammar and reading in texts of moderate difficulty.  
 Mr. Ford
- 34.116 Intermediate Russian** (Prereq. 34.115) 4 Cl.; 4 Q.H.  
 Continuation of work and aims of 34.115.  
 Mr. Ford
- 34.117 Russian Composition and Conversation** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 Designed to develop skills in speaking and writing of colloquial Soviet usage of the Russian language. Classroom work is supplemented by tapes.  
 Mr. Ford Fall and Winter Qtrs.
- 34.118 Russian Composition and Conversation** (Prereq. 34.117) 4 Cl.; 4 Q.H.  
 Continuation of 34.117.  
 Mr. Ford Spring and Summer Qtrs.

- 34.119 Scientific Russian** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 Scientific readings in the areas of mathematics, chemistry, physics and biology. It is designed to acquaint the student with a specialized vocabulary and grammatical understanding of the texts.  
 Staff Offered on alternate years.
- 34.120 Russian Expository Prose** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 Selected readings of lectures, speeches, essays and critical studies by outstanding Russian scholars.  
 Staff Offered on alternate years.
- 34.121 Russian Short Story of the Nineteenth Century** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 Detailed analysis of selected short stories of the nineteenth century read in Russian, and the study of the development of the genre.  
 Staff Offered on alternate years.
- 34.122 Russian Drama of the Nineteenth Century** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 Detailed analysis of selected representative plays read in Russian, and the study of the development of this genre.  
 Staff Offered on alternate years.
- 34.123 Russian Folklore** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 Various genres of Russian folk literature are read in Russian, and the readings are supplemented by lectures and tape recordings.  
 Staff Offered on alternate years.
- 34.124 Russian Poetry** (Prereq. 34.116) 4 Cl.; 4 Q.H.  
 The major works of important classical and modern poets are read in Russian and analyzed.  
 Staff Offered on alternate years.
- 34.125 Pushkin's Artistic Prose** (Prereq. consent) 4 Cl.; 4 Q.H.  
 Reading of Pushkin's major prose fiction in the original, accompanied by stylistic and structural analyses. Background materials and articles of criticism to be consulted. Individual oral presentations by students (in English) and research papers (in English) by arrangement with instructor.  
 Prof. Spiegel Offered on alternate years.
- 34.126 Pushkin's Narrative Poetry** (Prereq. consent) 4 Cl.; 4 QH.  
 Reading of Pushkin's narrative poems in the original, accompanied by the study of the author's poetic techniques and devices. The evolution of this genre will be examined in the light of literary trends, influences and controversies. Research papers on selected topics in English.  
 Prof. Spiegel Offered on alternate years.

- 34.151 Elementary Russian I** 4 Cl.; 4 Q.H.  
 Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.  
 Prof. Spiegel and Staff Fall and Winter Qtrs.
- 34.152 Elementary Russian II** (Prereq. 34.151) 4 Cl.; 4 Q.H.  
 Continuation of grammar study; oral and written exercises.  
 Prof. Spiegel and Staff Spring and Summer Qtrs.
- 34.290 Directed Study** 4 Q.H.  
 Staff All Quarters

## Italian

- 35.115 Intermediate Italian I** (Prereq. 35.152) 4 Cl.; 4 Q.H.  
 Continuation of grammar, oral practice and the reading of selected texts.  
 Prof. Fabrizi and Staff
- 35.116 Intermediate Italian II** (Prereq. 35.115) 4 Cl.; 4 Q.H.  
 Continuation of 35.115, with greater emphasis on reading.  
 Prof. Fabrizi and Staff
- 35.151 Elementary Italian I** 4 Cl.; 4 Q.H.  
 Essentials of grammar; practice in speaking and reading; progressive acquisition of basic language skills.  
 Staff Fall and Winter Qtrs.
- 35.152 Elementary Italian II** (Prereq. 35.151) 4 Cl.; 4 Q.H.  
 Continuation of grammar study and basic language skills; reading of Italian of increasing difficulty; practice in conversation.  
 Staff Spring and Summer Qtrs.

## Journalism

- 38.101 History and Principles of Journalism** 4 Cl.; 4 Q.H.  
 Development of American journalism from European and English beginnings; the problems and contributions of the "Colonial Press", the Revolutionary War period, the "Party Press", the "Penny Press", and the leading contributions to early American journalism; the evolution of freedom of the press and the concurrent responsibility of the press media to this freedom; some writing.  
 Prof. Speers Fall and Winter Qtrs.
- 38.102 History and Principles of Journalism** 4 Cl.; 4 Q.H.  
 A continuation of 38.101 from mid-nineteenth century; America's great personal journalists and mass circulation "giants" and their contributions: Greeley, Bennett, Raymond, Dana, Grady, Nelson, Ochs, White, Medill,

Pulitzer, Hearst, Scripps, Howard, McCormick and others; the relationships of journalism to such events as the Civil War, the Spanish-American War; the unfolding principles; some writing.

Prof. Speers

Spring Qtr.

### **38.103 Fundamentals of Newswriting**

4 Cl.; 4 Q.H.

Functions of the editorial department and procedures in obtaining and writing news stories; extensive practice in writing news stories.

Mrs. Ackerman and Mr. Quarrington

Fall and Winter Qtrs.

### **38.104 Fundamentals of Newswriting**

(Prereq. 38.103 or Consent of Instructor) 4 Cl.; 4 Q.H.

Problems of reporting and news writing with written assignments in various types of spot news reporting.

Mrs. Ackerman and Mr. Quarrington

Spring and Summer Qtrs.

### **38.105 Techniques of Journalism**

(Prereq. 38.104 or Consent of Instructor) 4 Cl.; 4 Q.H.

Advanced practice in writing news stories along with editorials, feature stories, criticisms, etc.

Mrs. Ackerman and Mr. Quarrington

Fall and Winter Qtrs.

### **38.106 Techniques of Journalism**

(Prereq. 38.105 or Consent of Instructor) 4 Cl.; 4 Q.H.

Editing the news with practice in copy editing, headline writing, and newspaper makeup.

Mrs. Ackerman and Mr. Quarrington

Spring and Summer Qtrs.

### **38.107 The Press and Society**

4 Cl.; 4 Q.H.

The relationships of the press media to American society; the various roles of the press; the unfolding legislative pattern before and after the First Amendment; some outstanding court cases concerning the press such as contempt of court, licensing, taxing the press; relationships between the press and the U.S. Post Office. A study project, working with professional newspapers, is required.

Prof. Speers

Fall and Winter Qtrs.

### **38.108 The Press and Society**

4 Cl.; 4 Q.H.

Some of the major legal considerations concerning the press media, such as libel and slander; right of privacy; the public's "right to know"; some current and past restrictive legislation. A study project, working with professional newspapers, is required.

Prof. Speers

Spring Qtr.

### **38.121 Television Newswriting**

4 Cl.; 4 Q.H.

Techniques of writing for television news as opposed to writing for other news media: the marriage of script to various video outputs; importance of the writer-reporter in both his new roles as a field-producer and a writer-producer; terms and language used in the production of TV news shows. Actual individual production of student news shows; field trips to TV stations; guest lecturers from the TV news media.

**38.190 Directed Study in Journalism**

4 Q.H.

Consent of Instructor.

Fall, Winter and Spring Qtrs.

## Economics

A prerequisite for all Economics courses is **39.108**, **39.115** or **39.125**, unless otherwise stated.

**39.105 Principles of Economics**

4 Cl.; 4 Q.H.

Development of macroeconomic analysis; review of national income concepts; national income determination, fluctuation, and growth; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade; balance of international payments.

Staff

Fall and Winter Qtrs.

**39.106 Principles of Economics**

4 Cl.; 4 Q.H.

The role of a market pricing system, demand and supply, in determining the allocation of resources to competing uses and why this system may not function adequately in certain areas; application of economic principles to private and public problems in such areas as pollution, poverty, racial discrimination, etc.

Staff

Spring and Summer Qtrs.

**39.115 Principles and Problems of Economics**

4 Cl.; 4 Q.H.

An introduction to the conceptual aspects of economics; the flow of national income; economic growth and fluctuation; the role of money and banking; monetary and fiscal policies; emphasis on developing conceptual tools for use in the analysis of economic problems facing modern society.

Staff

Fall and Winter Qtrs.

**39.116 Principles and Problems of Economics**

4 Cl.; 4 Q.H.

Development of basic theory of demand, supply and market price; applications to selected microeconomic problems, such as basic economics of monopoly and competition, poverty, race and discrimination, urban affairs, pollution and other problems which relate to the role of the pricing system in resource allocation and income distribution.

Staff

Spring and Summer Qtrs.

**39.125 Economics**

4 Cl.; 4 Q.H.

Macroeconomic problems, theory and policy; basic economic concepts and the institutional setting of the American economic system, its goals and problems; national income and product definition and measurement; the theory of income determination; the relation between prices and money; the mechanics of commercial banking operations, central banking and monetary policy; government and fiscal policy; appraisal of stabilization policies; economic growth theory and problems.

Prof. Herman

Fall and Winter Qtrs.



**39.126 Economics**

4 Cl.; 4 Q.H.

Explanation of elements of demand, supply and cost, market pricing, and allocation of resources; application of market theory to selected current areas of concern: pollution, poverty, racial discrimination, urban problems, monopoly and competition, etc.

Prof. Herman

Spring and Summer Qtrs.

**39.190, 39.191 Directed Study**

4 Q.H.

Independent work under the direction of member of the Department on a chosen topic. Limited to qualified seniors majoring in Economics with approval of Department.

Staff

**39.250 Statistics**

4 Cl.; 4 Q.H.

Data presentation, descriptive statistics, probability and inference, choice and properties of estimators, hypothesis testing, bivariate regression and correlation (and analysis of variance).

Staff

Fall and Winter Qtrs.

**39.251 Statistics**

(Prereq. 39.250) 4 Cl.; 4 Q.H.

Problems inherent in employing statistical methods for the quantification and testing of economic theory. Topics include: multicollinearity, simultaneous equation bias, autocorrelation, and identification.

Staff

Spring and Summer Qtrs.

**39.255 Microeconomic Theory**

4 Cl.; 4 Q.H.

A detailed study of supply and demand analysis; various elasticity concepts and applications; theory of consumer demand; theory of production; derivation of cost curves; detailed analysis of pricing and output behavior in the several market structures with their welfare implication; the pricing of resources.

Staff

Fall and Winter Qtrs.

**39.256 Macroeconomic Theory**

4 Cl.; 4 Q.H.

Investigation of the conceptual and empirical problems of creating and using national accounts; price index problems; conceptual and empirical evaluation of several consumption and investment functions, and their policy implications; multiplier and accelerator models; a brief history of recent cyclical fluctuations. Theories of inflation and growth are analyzed in the light of recent economic history.

Staff

Spring and Summer Qtrs.

**39.259 European Economic History**

4 Cl.; 4 Q.H.

Short Greco-Roman and Middle Ages background. Economic inheritance of the nineteenth-century development of capitalism and laissez-faire; the aftermath of the Industrial Revolution; European overseas expansion. The twentieth century; the world wars; the dissolution of empires; American economic conquest and European integration; the future of less developed areas in southern Europe.

Prof. Schachter

Fall and Winter Qtrs.

**39.260 American Economic History**

4 Cl.; 4 Q.H.

Economic development of U.S. from colonial period to the present; historical changes in available factors; economic institutions and technologies; special attention to preconditions of industrialism; U.S. Industrial Revolution, its spread and socioeconomic consequences; Great Depression; subsequent rise of mixed economy and welfare state; U.S. adjustments to postwar economic changes.

Prof. Shelby

Spring Qtr.

**39.265 Money and Banking**

(Prereq. only 39.105, 39.115 or 39.125) 4 Cl.; 4 Q.H.

The nature and function of money, credit, and monetary standards, and the role of our monetary and banking system in the economy. Topics include commercial banking, monetary theory and policy, the role and instruments of the Federal Reserve System, and international monetary problems.

Prof. Caligaris

Spring and Summer Qtrs.

**39.266 Government Finance**

4 Cl.; 4 Q.H.

Fiscal functions, institutions and politics; growth of the public sector; expenditure planning in theory and practice; cost-benefit analysis; principles of taxation and tax incidence; major taxes at Federal and state-local levels; fiscal policy for high employment, price stability and growth; current fiscal problems such as tax reform, urban fiscal problems, fiscal federalism and income maintenance programs.

Prof. Musgrave

Fall and Winter Qtrs.

**39.268 Urban Economics**

4 Cl.; 4 Q.H.

An inquiry into the causes of the location and the growth of urban centers; economic analysis of selected urban problems.

Prof. Brown

Fall and Winter Qtrs.

**39.269 Urban Economic Problems and Policies**

4 Cl.; 4 Q.H.

Sequel to Urban Economics; detailed analysis of urban problems, such as housing, transportation, land use, public services. Exploration of public policies related to such problems.

Prof. Brown

Spring and Summer Qtrs.

**39.271 Social Control of Economic Activities**

4 Cl.; 4 Q.H.

Historical development of the government's role in economic affairs. The relationships between the government and industry, labor, agriculture, public utilities, consumers; economy in general; antitrust laws and their effects on market structure and performance; theoretical analysis of interaction of various sectors of the economy.

Prof. Horowitz

Fall and Winter Qtrs.

**39.273 Industrial Organization and Public Policy** (Prereq. 39.255) 4 Cl.; 4 Q.H.

The theoretical framework for analysis and evaluation of the static and dynamic performance of real markets. An examination of the empirical studies testing the usefulness of applying theory to real markets. An exami-

nation of antitrust as a public policy designed to promote better market performances.

Prof. Meehan

Spring Qtr.

### **39.275 Labor Economics**

4 Cl.; 4 Q.H.

Examination of the economics of the labor market and the labor force and of the institutions and policies dealing with them; employment, unemployment, wage determination, income distribution, and the development and efficient use of labor resources; development of trade unions; collective bargaining issues and their economic consequences.

Prof. Herrnstadt

Winter and Spring Qtrs.

### **39.277 Economics of the Quality of Urban Environment and Control**

4 Cl.; 4 Q.H.

Economic analysis of air, water, thermal and noise pollution; the utilization of urban space and other urban resources; identification of possible economic effects of urban environment, such as crime, delinquency, immobility, and congestion, etc.

Mr. Swanson

Fall and Winter Qtrs.

### **39.278 Poverty and Discrimination**

4 Cl.; 4 Q.H.

Dimensions of poverty in America; the economics of race and racism; analysis of other contributors to income and wealth inequities: age, education and sex discrimination; domestic and world poverty.

Prof. Kidder

Fall and Winter Qtrs.

### **39.279 Manpower and Anti-Poverty Policies and Programs**

4 Cl.; 4 Q.H.

Sequel to the Economics of Poverty and Discrimination; assessment of government and private efforts to fight poverty and improve the labor market position of impoverished groups; relationship between causes of poverty and discrimination; and possible remedies. Manpower training programs, negative income tax, family allowances and other income maintenance schemes.

Prof. Herrnstadt

Spring and Summer Qtrs.

### **39.280 Comparative Economics**

4 Cl.; 4 Q.H.

Competing types of theoretical economic systems; analysis of organization and operation of currently existing types of Communist, Socialist, and Capitalist economies; comparison and evaluation of economic behavior and performance of different economic systems.

Prof. Shelby

Spring and Summer Qtrs.

### **39.281 Mathematical Economics I**

(Prereq. 10.105; calculus *not* required) 4 Cl.; 4 Q.H.

A first course in the application of simple mathematical analysis to economics. Solutions of simultaneous equations, properties of determinants, static, input-output analysis, national income and general equilibrium models, linear programming.

Staff

Fall and Winter Qtrs.

**39.282 Mathematical Economics II**

(Prereq. 39.281 or permission of instructor) 4 Cl.; 4 Q.H.

Introduction to calculus for economists; comparative statics, optimization theory, examples from economic theory; introduction to dynamic economic models.

Staff

Spring Qtr.

**39.285 Economic Development**

4 Cl.; 4 Q.H.

Prospects for economic growth in poor nations as indicated by economic analysis and historical experience; social, cultural, and institutional determinants of growth; implications for the international position and policies of the U.S.

Prof. Schachter

Fall and Winter Qtrs.

**39.286 International Economics**

4 Cl.; 4 Q.H.

Introduction to the theory of international trade, and its role in resource allocation; implications of economic welfare; foreign exchange; the balance of payments mechanism; and problems of disequilibrium and adjustment.

Mr. Lapan

Spring Qtr.

**39.288 Economic Growth and Instability**

4 Cl.; 4 Q.H.

Measurement and cost of economic growth and instability; long-run models and explanations of aggregate growth; short-run models and causes of fluctuations in output, employment, and prices; long-run projections and short-run forecasts of aggregate change; policies for optimal growth and stability.

Prof. Shelby

Fall and Winter Qtrs.

**39.289 Advanced Economic Theory** (Prereq. 39.255 and 39.256) 4 Cl.; 4Q.H.

Advanced theoretical treatment of selected topics in microeconomics and macroeconomics. Recommended for students planning to take graduate economics.

Staff

Spring Qtr.

**39.291 Senior Economic Seminar** (Prereq. 39.255 and 39.256) 4 Cl.; 4 Q.H.

Course for senior Economics majors; coordinating and applying economic concepts, methodology, and data to contemporary issues and problems of broad social, economic, and philosophical importance.

Prof. DeCicco

Spring Qtr.

**39.292 History of Economic Thought**

4 Cl.; 4 Q.H.

Comprehensive course of study in the development of economic thought. Coverage includes mercantilism as the first economic doctrine; analysis of older classical school, its later refinements (modern marginalism), and its important critics (Socialists, Marxists); Keynesian and modern developments.

Staff

Spring Qtr.

**39.293 Statistical Methods**

(Prereq. 39.251) 4 Cl.; 4 Q.H.

Principles of probability and statistical inference. Topics include: estimation and tests of significance, analysis of variance, combinational analysis, appli-

cation of methods of statistical inference to business and economic research.  
Computer programming.

Staff

Fall and Winter Qtrs.

#### **39.294 Quantitative Methods**

(Prereq. 39.251) 4 Cl.; 4 Q.H.

Introduction to applied quantitative methods of decision theory in economic systems with emphasis on programming, optimization, and decentralized approaches to optimal static and dynamic decision rules in specific policy (government and business) applications.

Staff

Spring Qtr.

#### **39.295, 39.296, 39.297, 39.298 Honors Program**

(each) 4 Q.H.

Prof. DeCicco

All Quarters

## **Accounting**

#### **41.111 Accounting Principles I**

4 Cl.; 4 Q.H.

The nature and purpose of accounting; measuring business operations and financial position. Accounting for business assets; an exploration of the relationship between business activity and accounting.

Prof. Richards and Staff

Winter Qtr.

#### **41.112 Accounting Principles II**

4 Cl.; 4 Q.H.

Accounting for financing business; a study of the uses of accounting data; general and special purpose reports to interested parties; appraising the results of business activity; income tax considerations.

Prof. Richards and Staff

Spring Qtr.

#### **41.117 Principles of Accounting**

10 Cl.; 10 Q.H.

Covers the content of courses 41.111 and 41.112. Intended for transfer students.

Staff

Summer and Fall Qtrs.

#### **41.201 Introduction to Accounting—I.E.**

4 Cl.; 4 Q.H.

To acquaint engineering students with the basic purposes, principles, and practices of financial accounting; to discuss cost patterns and measurements in terms of their limits and usefulness; and to familiarize students with managerial accounting including such topics as break-even analysis, budgets, standard costs, and capital budgets.

Prof. Lindhe

Fall and Winter Qtrs.

#### **41.205 Cost Accounting**

(Prereq. 41.112) 4 Cl.; 4 Q.H.

Basic cost theory and practice; cost data as management tool; cost volume-profit analysis; introduction to capital budgeting.

Prof. Richards

Fall and Winter Qtrs.

#### **41.207 Analysis of Financial Statements**

(Prereq. 41.112) 4 Cl.; 4 Q.H.

Preparation of accounting statements; uses of ratios and analytical statements; composition of statements and statement classification; fund and cash flow analysis.

Prof. Richards

Spring and Summer Qtrs.

- 41.208 Introduction to Accounting—Pharmacy** 4 Cl.; 4 Q.H.  
 Uses of accounting; recording processes; trading enterprises; alternative recording systems; analytical uses of accounting; payroll accounting; planning and forecasting from accounting data.  
 Prof. Richards and Staff Spring and Summer Qtrs.
- 41.209 Distribution Cost Analysis** (Prereq. 41.112) 4 Cl.; 4 Q.H.  
 Cost accounting with a major emphasis toward applications for marketing purposes; cost accumulation and analysis; uses of costs and cost techniques for control. Pricing will be stressed.  
 Staff Spring and Summer Qtrs.
- 41.210 Accounting Principles** (Prereq. 39.116) 4 Cl.; 4 Q.H.  
 For Liberal Arts undergraduates. Accounting as an analytical tool of management; financial statement analysis; corporate financial reporting; investments; financial planning.  
 Staff Spring and Summer Qtrs.
- 41.212 Accounting Analysis for Decision-Making I** (Prereq. 41.205) 4 Cl.; 4 Q.H.  
 This course builds up the student's basic knowledge of accounting; providing him with the opportunity to analyze accounting data for use in management decisions. The course stresses use of the information as opposed to its compilation, and relates the work through case problems involving decision-making at middle and upper management levels. Areas covered include cost control, capital investment, product mix, transfer pricing, and evaluation of division managers.  
 Prof. Curran Fall Qtr.
- 41.213 Federal Income Taxes** (Prereq. 41.112) 4 Cl.; 4 Q.H.  
 A basic survey of the Federal tax structure; an appreciation and understanding of the impact of taxation on business decision. Application of tax principles will be illustrated by specific problems. Estate and trust planning.  
 Prof. Malchman Spring and Summer Qtrs.
- 41.214 Accounting Analysis for Decision-Making II** (Prereq. 41.212) 4 Cl.; 4 Q.H.  
 Continuation of 41.212.  
 Prof. Lindhe Fall and Winter Qtrs.
- 41.251 Intermediate Accounting** (Prereq. 41.112) 4 Cl.; 4 Q.H.  
 The emphasis is on accounting theory and concepts together with an analysis of the special problems that arise in applying these concepts to financial accounting. Areas discussed include the basic accounting process, cash receivables, liabilities, and inventory valuation.  
 Prof. Curran Fall and Winter Qtrs.
- 41.252 Intermediate Accounting** (Prereq. 41.251) 4 Cl.; 4 Q.H.  
 Continuation of the discussion of the traditional structure of accounting theory and its underlying issues together with an evaluation of the conflicts

and shortcomings in accounting concepts. Areas discussed include investment in productive resources and accounting for corporations.

Prof. Curran

Spring and Summer Qtrs.

**41.253 Cost Accounting**

(Prereq. 41.112) 4 Cl.; 4 Q.H.

The accumulation of cost data for managerial analysis and control; process cost accounting and the costing of by-products and joint products.

Prof. Lans

Fall and Winter Qtrs.

**41.254 Cost Accounting**

(Prereq. 41.253) 4 Cl.; 4 Q.H.

Estimated cost systems; budgetary control with standard costs; the cost and profit analyses for decision-making purposes.

Prof. Lans

Spring and Summer Qtrs.

**41.255 Advanced Accounting**

(Prereq. 41.252) 4 Cl.; 4 Q.H.

Varied accounting systems including partnerships, home and branch, parent and subsidiary; foreign exchange.

Prof. Malchman

Fall and Winter Qtrs.

**41.256 Advanced Accounting**

(Prereq. 41.255) 4 Cl.; 4 Q.H.

Specialized accounting areas including consignment and installment sales, receivership, municipal and institutional accounting; estate and trust accounting; taxation and planning.

Prof. Malchman

Spring and Summer Qtrs.

**41.257 Auditing**

(Prereq. 41.252) 4 Cl.; 4 Q.H.

Designed to give the Accounting major a thorough knowledge of auditing through the application of auditing principles and adherence to auditing standards; the ethics of the profession together with the impact of new and advanced audit techniques.

Prof. Richards

Spring and Summer Qtrs.

**41.260 Taxes**

4 Cl.; 4 Q.H.

Basic Federal taxation as it applies to individuals, partnerships, and corporations.

Prof. Malchman

Fall and Winter Qtrs.

**41.261 Role of Accounting in Decision-Making** (Prereq. 41.256) 4 Cl.; 4 Q.H.

A study of business problems and the role accounting can and should play in their solution.

Prof. Slavin

Fall and Winter Qtrs.

**41.262 Accounting Theory and Practice**

(Prereq. 41.252) 4 Cl.; 4 Q.H.

Staff

Fall and Winter Qtrs.

**41.263 Accounting Planning and Control**

(Prereq. 41.254) 4 Cl.; 4 Q.H.

Staff

Spring and Summer Qtrs.



- 41.264 Advanced Accounting Problems** (Prereq. 41.252) 4 Cl.; 4 Q.H.  
 Planned primarily for those students who intend to enter the area of professional accounting. Topics include partnerships, installment sales, consignments, home office branch relationships, consolidations, governmental and institutional accounting.  
 Prof. Malchman Fall and Winter Qtrs.
- 41.265 Management Accounting** (Prereq. 41.112) 4 Cl.; 4 Q.H.  
 Designed to study management decision-making, including planning and control, from the accountant's point of view. Involves designing and analyzing the relevant accounting system. The accountant's role as a consultant to management is also considered.  
 Prof. Lindhe Fall and Winter Qtrs.
- 41.266 Contemporary Accounting Problems** (Prereq. 41.252) 4 Cl.; 4 Q.H.  
 Prof. Malchman Spring and Summer Qtrs.
- 41.267 Tax Factors in Business Decisions** 4 Cl.; 4 Q.H.  
 Prof. Richards Spring and Summer Qtrs.
- 41.268 Appraisal of Management Enterprise** 4 Cl.; 4 Q.H.  
 Staff Spring and Summer Qtrs.
- 41.270 Seminar** (Prereq. Acct. Senior) 4 Cl.; 4 Q.H.  
 The seminar consists of discussion of reports on selected topics in accounting literature.  
 Prof. Lindhe Fall and Winter Qtrs.
- 41.271 Seminar** (Prereq. Acct. Senior) 4 Cl.; 4 Q.H.  
 Prof. Lindhe Spring Qtr.

## Marketing

- 43.120 Introduction to Marketing** 4 Cl.; 4 Q.H.  
 An overview of marketing and its role both within the firm and within society, with emphasis upon the pervasive interrelationships between dynamic dimensions of the environment, marketing activities, consumer attitudes, and consumer behavior. Open as elective to non-CBA sophomore and upper-class students.  
 Senior Dept. Members and Staff All Quarters
- 43.125 Consumer Problems of the 70s** 4 Cl.; 4 Q.H.  
 The public control of marketing effort. Elective open to all upperclassmen.  
 Prof. Collazzo Fall and Winter Qtrs.
- 43.221 Current Issues in Marketing** 4 Cl.; 4 Q.H.  
 Reading, analysis, and discussion of current and controversial topics in domestic and international marketing. Upper-class elective for non-Marketing majors.  
 Prof. Collazzo Summer Qtr.



**43.222 Marketing Policies and Problems**

4 Cl.; 4 Q.H.

Management's analytical approach in a variety of firms to product planning, channels of distribution, advertising, personal selling, sales promotion, pricing, and marketing research. Upper-class elective for non-Marketing majors.  
 Prof. Minichiello Every other year, Fall and Winter Qtrs.

**43.223 Introduction to Advertising**

4 Cl.; 4 Q.H.

An overview of advertising and its role in our society. Advertising is examined 1) as part of marketing, 2) as a communications process, 3) as a viable social and economic force. All upperclassmen.  
 Prof. Duffon Fall and Winter Qtrs.

**43.233 Retail Management**

(Prereq. 43.250 or perm. of instructor) 4 Cl.; 4 Q.H.

From a marketing management point of view, the activities and contributions of major retailing institutions, including department and specialty stores, supermarkets, and discount outlets. Upper-class elective.  
 Prof. Minichiello Spring and Summer Qtrs.

**43.235 Marketing Channels**

(Prereq. 43.250 or perm. of instructor) 4 Cl.; 4 Q.H.

Marketing structures and institutions; their evolution, functions, interrelationships, and the management of their role in the marketing process. Upper-class elective.  
 Prof. Verma Fall and Winter Qtrs.

**43.240 Marketing Research**

(Prereq. 43.251 or perm. of instructor) 4 Cl.; 4 Q.H.

The use of marketing research as a tool in planning and controlling marketing activities, including an introduction to the application of behavioral and quantitative concepts in the solution of marketing programs. Upper-class elective. Required for Marketing juniors.  
 Prof. Wiseman Fall and Winter Qtrs.

**43.242 Sales Management**

(Prereq. 43.250) 4 Cl.; 4 Q.H.

Creation, management, and appraisal of the sales force. Case studies and discussions, plus selected readings. Junior and senior elective.  
 Prof. Morrison Spring Qtr.

**43.244 Quantitative Methods for Marketing Management**

4 Cl.; 4 Q.H.

A study of the contribution that quantitative techniques and the use of the computer can make to decision-making in marketing and related business policy areas. Junior and senior elective.  
 Prof. Verma, Prof. Wiseman Spring Qtr.

**43.250 Marketing Management I**

(Required of Mktg. Majors.) 4 Cl.; 4 Q.H.

An introduction to market analysis and the design and implementation of marketing strategies. A primary concern is the appraisal of the environment of business and marketing activities with particular emphasis on factors affect-

ing the nature and extent of consumer demand. An upper-class elective prerequisite to a number of elective Marketing courses. Open to non-Marketing majors in middler, junior, and senior years.

Prof. Minichiello, Prof. Verma

Fall and Winter Qtrs.

#### **43.251 Marketing Management II**

(Prereq. 43.250) 4 Cl.; 4 Q.H.

A continuation of 43.250. Based on understanding of business and marketing environment and of consumer demand, this quarter of the course focuses on the interrelated roles of product, price, distribution and promotion in the development and operation of marketing programs. Upper-class elective required of Marketing middlers.

Prof. Dufton

Spring and Summer Qtrs.

#### **43.261 International Marketing**

4Cl.; 4 Q.H.

The opportunities, methods, and policies in management of international marketing programs. Upper-class elective.

Prof. Verma

Fall and Winter Qtrs.

#### **43.262 Advertising Management**

(Prereq. 43.251 or perm. of instructor) 4 Cl.; 4 Q.H.

A study of advertising management through class discussions of case studies selected to illustrate means of achieving proper balance and coordination of advertising with other elements in the marketing mix. Junior and senior elective.

Prof. Dufton

#### **43.265 Industrial Marketing**

(Prereq. 43.250 or perm. of instructor) 4 Cl.; 4 Q.H.

The marketing of products where business firms are the potential customers. Upper-class elective. Open to juniors and seniors.

Prof. Morrison

Spring Qtr.

#### **43.270 Senior Seminar in Marketing**

(Prereq. 43.251) 4 Cl.; 4 Q.H.

A study in depth of selected topics in marketing. The subjects explored will differ each time the seminar is offered, dependent upon the research interests of the instructor. An elective course open only to seniors.

Senior Members of the Dept.

Spring Qtr.

#### **43.271 New Product Development**

(Prereq. 43.251) 4 Cl.; 4 Q.H.

The primary concern is with the examination and analysis of the problems which firms face in directing and managing their new product development activities. Open to seniors only.

Profs. McDonald, Verma

Fall and Winter Qtrs.

#### **43.272 Marketing to Low-Income Consumers**

4 Cl.; 4 Q.H.

An analysis of consumer buying behavior and of current business marketing practices and opportunities in low-income markets and areas. Upper-class elective.

Prof. Dufton

Fall and Winter Qtrs.

#### **43.275 Foundations of Consumer Behavior**

(Prereq. 43.251) 4 Cl.; 4 Q.H.

Economic, behavioral, and other models of consumer behavior are examined as bases for the planning and evaluation of marketing effort. Upper-class elective.

Profs. Dufton, McDonald

Spring Qtr.

- 43.277 History of Marketing Thought** (Prereq. 43.251) 4 Cl.; 4 Q.H.  
 An analytical survey of the evolution of marketing and marketing thought. Emphasis will be placed on changes in the role of marketing as practiced by business firms and as viewed by society. All upperclassmen.  
 Prof. Collazzo Every other year, Spring Qtr.

- 43.278 Competitive Strategy** (Prereq. 43.251) 4 Cl.; 4 Q.H.  
 The capstone marketing course for seniors majoring in Marketing. At a policy level, the focus is upon the formulation and implementation of marketing strategy in a dynamic environment. Senior elective, required of Marketing seniors.  
 Prof. McDonald Fall and Winter Qtrs.

## Finance and Insurance

- 44.120 Introduction to Financial Activity** 4 Cl.; 4 Q.H.  
 Acquaints students with the important analytical tools, habits of thought, concepts and knowledge surrounding the management of the flow of funds within the corporation. Deals with the firm's demand for capital, sources of capital, management of assets, dividend payments, and forecasting of funds needs.  
 Prof. Cossaboom and Staff All Quarters

- 44.144 Management of Financial Institutions** (Prereq. 44.120) 4 Cl.; 4 Q.H.  
 The broad range of decision-making problems faced by major financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking business entities. The course will consider such topical areas as the nature and scope of the capital markets confronting these institutions, specialized problems with regard to the sources and uses of funds of the financial institutions, the nature of competition, the regulation of the financial institutions, and strategic policy planning of financial institutions.  
 Prof. Fletcher

- 44.150 Corporate Financial Management** (Prereq. 44.120) 4 Cl.; 4 Q.H.  
 Extends a student's grasp of theory and analytical tools and concepts which have general applicability in most profit- and nonprofit-seeking organizations through readings and case discussions. Such analysis is primarily concerned with the evaluation of expected benefits from invested capital in relation to its costs and availability. While techniques of economic appraisal are stressed, the course also aims to locate financial valuation within the overall structure of the administrative decision concerned with the allocation of an organization's financial resources.  
 Profs. Cerullo, Kaen, Fletcher, Marple Fall and Winter Qtrs.

- 44.151 Interpreting Financial Data** (Prereq. 44.120) 4 Cl.; 4 Q.H.  
 Interprets the financial data generated for the management of an organization. The variety of assumptions and practices utilized to prepare financial reports, managerial statements, and tax returns are explained and analyzed.

The discrepancy between the data needed for economic analysis and the data generated in standard financial reports is described. Current topics in financial reporting are discussed centering around the activities of the AICPA and the SEC.

Profs. Caplan and Hehre

Fall and Winter Qtrs.

#### **44.159 Small Business Finance**

(Prereq. 44.120) 4 Cl.; 4 Q.H.

Investigates the financial requirements of smaller businesses and the sources of funds open to them. Methods of financial control in the small business are covered, as well as requirements of financing institutions. The problem of obtaining adequate equity financing and equity sources is highlighted.

#### **44.160 International Financial Management**

(Prereq. 44.150) 4 Cl.; 4 Q.H.

The issues and problems encountered by the finance function of an international firm. Considers the investment and financing decisions of a firm in the context of an international or multi-country environment. Specific topics include capital budgeting, capitalization policies, the use of Eurocurrency and Euro-bond markets, and liquidity management by the international firm.

Prof. Kaen

#### **44.161 Financial Control Systems**

4 Cl.; 4 Q.H.

The control process in the management of any organization and the role of systematic financial controls in facilitating that process. The needs of financial managers, as key participants in the process, are given particular attention. The relationships between financial planning activities and financial control are examined. Other areas of emphasis in the course include profit planning, budgeting, performance evaluation and incentives tied to measured performance.

Prof. Caplan

#### **44.162 Risk Management**

(Prereq. 44.120) 4 Cl.; 4 Q.H.

The concept of risk and the ways of dealing with it including risk reduction, risk combination, and insurance. Considerations of cost and risk management in comparison to the risk-cost preferences of the insurer are examined.

#### **44.240 Personal Finance**

(Open to CBA students only with perm. of instructor) 4 Cl.; 4 Q.H.

The management of the total personal estate; budgeting, savings, insurance; investments, borrowing, taxes, social security, pensions, annuities, securities markets, mutual funds, and their integration.

Prof. Cerullo

All Quarters

#### **44.242 Capital Structure**

(Prereq. 44.150) 4 Cl.; 4 Q.H.

Business management problems related to raising the supply of funds needed by the firm to accomplish management's business objectives. Standard and innovative types of securities and financing arrangements are surveyed along with techniques for determining the best mix of financing sources for the

firm. Student teams will be assigned to study and report on the financing problems and actions of several local firms.

Prof. Cossaboom

**44.243 Capital Budgeting** (Prereq. 44.150) 4 Cl.; 4 Q.H.

The allocation of corporate resources to long-term uses within the firm, including the development of investment opportunities as well as systems for their evaluation and selection.

Prof. Marple

**44.250 Life Insurance** (Prereq. 44.162) 4 Cl.; 4 Q.H.

Modern approaches to personal and business uses of life insurance; emphases are on principles and the underlying reasons for the various contract provisions, actuarial computations, underwriting practices, and legal doctrines. Includes an introduction to the types, organization, and functions of life insurance companies.

Spring and Summer Qtrs.

**44.252 Property and Liability Insurance** (Prereq. 44.162) 4 Cl.; 4 Q.H.

Modern approaches to insurance against financial loss from the destruction of property or from legal liability to others because of accidental occurrences; special emphasis on underlying reasons for various contract provisions, underwriting practices, and legal doctrines related to the various lines of property and liability insurance. Includes an introduction to the types, organization, and functions of property and liability insurance companies.

**44.255 Estate Planning** (Prereq. 44.120) 4 Cl.; 4 Q.H.

The nature and process of estate planning; integration of life insurance into overall estate plan; correlation with wills, trusts, gifts, marital deduction, and joint ownership; tax treatment; funding business continuation and estate liquidity requirements.

Prof. Willett

**44.260 Financial Planning** (Prereq. 44.120) 4 Cl.; 4 Q.H.

A review and evaluation of the theory and practice related to forecasting business and financial operations on both short and long run. Particular attention is paid to controlling operations within goals and plans established by management and within constraints imposed by the industry and national economy. The relationship of the business enterprise with the national economy is stressed.

Prof. Hehre

Spring and Summer Qtrs.

**44.270 Investment Management** (Prereq. 44.120) 4 Cl.; 4 Q.H.

Investment goals and objectives; various types of investments compared; the role of the securities markets; the design of portfolios with different objectives.

Prof. Willett

**44.272 Security Analysis**

(Prereq. 44.120) 4 Cl.; 4 Q.H.

The topic is broadly covered, with emphasis on application of knowledge gained in previous courses to analysis of developments within the firm and their effect on stock prices. Specific topics include the impact of accounting on reported earnings, present value of future dividends and capital gains, evaluation of sales, earnings, and management. Primary focus is on fundamental analysis of common stock, but attention is also given technical analysis as well as analysis of fixed income and convertible securities.

Prof. Kaen

**44.275 Money and Economic Activity**

(Prereq. 44.120) 4 Cl.; 4 Q.H.

It was said that "money is that institution which brought the humanity from a primitive stage into civilization." American industrial society is also inconceivable without the help of a sound and well-organized monetary and banking system. Thus, the study of money and economic activity is indisposible for any students in business and finance. An investigation of the money and capital markets is at the center of this course.

Profs. Fletcher and Rugina

Spring and Summer Qtrs.

**44.281 Seminar in Finance**

(Prereq. 44.150, 44.151, 44.260, 44.275) 4 Cl.; 4 Q.H.

The objective of this course is twofold: (1) to investigate items of current concern to the financial world either of a theoretical or practical nature; and (2) to allow the student of finance the opportunity to research a topic of his own choice in depth. Such topics as are approved by the instructor will be reported on to the class by the students. All students are required to submit written reports and to participate in discussions and critiques.

Prof. Hehre and Staff

**44.290 Business Ethics**

4 Cl.; 4 Q.H.

The survival of our American economic system depends, to a considerable degree, on the faith the public has in the integrity of our business leaders. Their decisions are emulated and affect our national, ethical, and economic health. Individual student participation in this course assists students in recognizing the added complexity brought to business problems by a consideration of ethics and/or responsibility and helps students to construct and solidify a personal code of ethics which they may follow in their own careers.

Prof. Willett

**44.295 The Development of the Capitalistic System**

4 Cl.; 4 Q.H.

Introduces the student to the arguments surrounding the nature and functioning of the American Capitalistic system and Capitalism in general. One school of thought accuses the system of being monopolistic, whereas another school defends the system as being competitive. Around this argument, excerpts from the work of great economists are used to show the development of tools of analysis for a better understanding of Western Capitalistic society and its problems.

Prof. Rugina



# Management

**45.112 Business Policy** (Prereq. 45.210) 4 Cl.; 4 Q.H.  
 Corporate strategy and its elements including an analysis of the company, its resources and opportunities, its environment and decision makers. Emphasis on decision making and implementation of strategy.  
 CBA Faculty All Quarters

**45.120 Organization and Management** 4 Cl.; 4 Q.H.  
 The language, environment, and structure of organization and management as it applies to business and other forms of economic activity and to the roles of various functional areas within the firm.  
 Prof. Keith and Staff All Quarters

**45.209 Organization Behavior I** 4 Cl.; 4 Q.H.  
 Applies concepts from the behavioral sciences to an understanding of the behavior of people in organization settings. Focus is on systematic approaches to understanding behavior; looking at people as individuals and as members of small groups; and determining implications for management. Emphasis on the development of student skills in applying behavioral concepts to situational problems.  
 Profs. Lent, Rochwarg, Timmons, Walker Fall and Winter Qtrs.

**45.210 Organization Behavior II** (Prereq. 45.209) 4 Cl.; 4 Q.H.  
 Continuation of study of behavior of people in organizations. Initial focus is on behavior of people in two-person relations and as members of separate groups. Later focus is on the understanding in large complex organizations and simultaneous development of student's skill in planning and achieving change.  
 Profs. Otlewski, Rochwarg, Timmons, Walker Spring and Summer Qtrs.

**45.250 Business and Society** (Prereq. 45.210) 4 Cl.; 4 Q.H.  
 An analysis of developing external influences and the business organization—social, legal, economic, cultural, ethical, and technical. Examination of the corporation in terms of its interactions with these forces. The course focuses on reconciling the strains generated by these societal factors and their impact on the management decision-making process.  
 CBA Faculty All Quarters

**45.251 Comparative Management** (Prereq. Sen. Stdg.) 4 Cl.; 4 Q.H.  
 How organization structure and management processes are shaped by the mission and objectives of the organization. Examination of different types of organizations—various types of profit-oriented business organizations, public corporations, governmental agencies, unions, schools and universities, research laboratories, police and military organizations, hospitals, trade associations, and voluntary organizations.  
 Prof. Marshall Fall and Winter Qtrs.

- 45.260 Personnel—Industrial Relations** (Prereq. 45.210) 4 Cl.; 4 Q.H.  
 Concerned with investigating man and his institutions in the world of work. The actors, i.e., business organizations, manager, workers, and unions will be examined in order to ascertain the assumptions, objectives, values, and behavior of each party under a set of societal constraints. Among the constraints to be considered are technology, market or budgetry, legal, public values, and the focus of power in society. Concerned with the interactions which occur between the parties in the system, the student studies current problem areas of personnel and industrial relations. The course takes a dual viewpoint—that of a social scientist examining the system and that of a manager operating within the system.  
 Profs. Hobart, Marshall, Otlewski All Quarters
- 45.261 Interpersonal Relations** (Prereq. 45.210) 4 Cl.; 4 Q.H.  
 An in-depth study of the process of communication and understanding between people at work. The course will focus on interpersonal problems and ways to facilitate understanding in two-person settings. Students will develop their own skills through readings, analysis of cases, and two person exercises during the course.  
 Prof. Walker Spring Qtr.
- 45.265 Production Management** (Prereq. 45.125) 4 Cl.; 4 Q.H.  
 The management of manufacturing activities. Topics include product design, method study, layout, inventory and production control, production standards, control of quality. Statistical techniques are emphasized.  
 Profs. Ammer, Olive, Shore All Quarters
- 45.271 Seminar in Management** 4 Cl.; 4 Q.H.  
 The changing nature of the manager's job. Through cases and readings the student develops a picture of the environment within which tomorrow's managers will operate and the nature of the new tasks involved.  
 Staff Spring Qtr.
- 45.275 Labor Law** (Prereq. 45.260, 39.275) 4 Cl.; 4 Q.H.  
 The changing judicial principles and statutory standards of employment and management-union relations since 1800.  
 Prof. Myers Fall and Winter Qtrs.
- 45.276 Seminar in Collective Bargaining** (Prereq. 45.275) 4 Cl.; 4 Q.H.  
 Cases or reports on problems faced by industrial relations department dealing with employees through collective bargaining; individual research.  
 Prof. Myers Spring Qtr.

## Transportation

- 48.101 Principles of Transportation** (Prereq. 39.105) 4 Cl.; 4 Q.H.  
 The political, social, and economic functions of transportation; development and structure of domestic transportation system; the nature of government regulation and promotion of the several modes.  
 Prof. Lieb Fall and Winter Qtrs.



**48.102 Current Issues in Transportation Policy** (Prereq. 48.101) 4 Cl.; 4 Q.H.  
 An overview of the regulatory process and its impact on the domestic transportation system; critical examination of topical policy issues which confront carriers, shippers, and the agencies of regulation.  
 Prof. Lieb Fall and Winter Qtrs.

**48.103 Carrier Management** (Prereq. 48.101) 4 Cl.; 4 Q.H.  
 The transportation system from the carrier's viewpoint, managerial response to a heavily regulated and rapidly expanding environment; focus on carrier decision making involving routes, scheduling, financing, and pricing of services.  
 Prof. Lieb Fall and Winter Qtrs.

**48.104 Business Logistics** (Prereq. 43.120) 4 Cl.; 4 Q.H.  
 Movement, distribution, and control of raw material and finished goods flows; examination of the importance of inventory control, scheduling, warehousing, and transportation in the design and operation of distribution systems.  
 Prof. Lieb Spring and Summer Qtrs.

**48.105 Urban Transportation** (Prereq. 48.101) 4 Cl.; 4 Q.H.  
 Impact of private and public transport systems on urban development; the planning and implementation of government programs concerning construction and promotion of system alternatives.  
 Prof. Lieb Spring and Summer Qtrs.

## General Business

**49.100 Introduction to Business** 4 Cl.; 4 Q.H.  
 The business organization as a system of interrelated functions and operations; the interactions between the organization and its environment; and the role of management in business organizations.  
 CBA Faculty Fall Qtr.

**49.101 Introduction to the Computer** (Prereq. 10.125) 4 Cl.; 4 Q.H.  
 Provides the undergraduate business student with a basic computer capability. The student will develop a familiarity with the computation center, an ability to write programs in Fortran, and experience in the use of canned programs. Skills developed will be reinforced and augmented in core and elective courses in upper-class years.  
 Profs. Briggs, Grossman and Staff Fall and Winter Qtrs.

**49.155 Legal Aspects of Business** 4 Cl.; 4 Q.H.  
 The legal aspects of business transactions and business relationships involving contracts, agency, negotiable instruments, suretyship and guaranty.  
 Profs. Fiumara, Scioletti All Quarters

**49.156 Management Planning and Control** (Prereq. 41.105, 45.210) 4 Cl.; 4 Q.H.  
 Develops systematic and integrated framework of concepts and theory useful for thinking about management control, for designing and implementing sys-

terms of management control. Integrates relevant material from the formal disciplines, particularly those in organizational behavior, with "control." Develops skill in analyzing real-world situations involving management control considerations. Achieves higher level of understanding of the interrelated nature of the management control process with other processes operating within an organization and the broader functional areas of business. The course will cover the following topics: basic conceptual framework; responsibility centers; measurement; expense centers; profit centers and transfer pricing; investment centers; planning and budgeting; control reporting; incentives for performance; organizational relationships (role of controller); and evaluation of comprehensive systems.

Prof. Caplan

**49.206 Management Information Systems** (Prereq. 49.251) 4 Cl.; 4 Q.H.

The design and implementation of a computer-based management information system. Includes programming, flow diagramming and documentation of business subsystems. A term project requirement provides experience with realistic design problems and computer application. Computer Model CDC 3300 is used.

Prof. Gubellini

Spring and Summer Qtrs.

**49.207 Introduction to Computer Applications** (Prereq. 10.125) 2 Cl.; 2 Q.H.

This elective course assumes no computer programming background and starts with an introduction to Fortran for business application. Individual study and exercises at the computation center are emphasized to cover simple programming. Students will use several prepared programs to solve realistic management problems—including linear programming, multiple regression analysis, statistical sample analysis, capital investment and risk assessment models, stock market portfolio analysis.

Prof. Briggs

Fall and Winter Qtrs.

**49.210 Legal Aspects of Business Organization** (Prereq. 45.155) 4 Cl.; 4 Q.H.

The legal aspects of the typical forms of business ownership; the law of sales transactions in business.

Prof. Fiumara

Fall and Winter Qtrs.

**49.240 Law in Society**

4 Cl.; 4 Q.H.

Acquaints the student, as a member of society, with his legal rights, obligations and responsibilities, applicable in his relationship with others and with the state.

Prof. Fiumara

Fall, Winter and Spring Qtrs.

**49.250 Quantitative Methods I**

(Prereq. 10.125) 4 Cl.; 4 Q.H.

Topics treated include descriptive statistics, statistical inference (probability, sampling, payoff table analysis, probability distributions, statistical estimation, hypothesis testing, and Bayesian statistics). The course will be characterized by a decision-making orientation.

Profs. Borack, Parsons, Wiseman, and Staff

Fall and Winter Qtrs.

**49.251 Quantitative Methods II**

(Prereq. 49.250) 4 Cl.; 4 Q.H.

Emphasis will be on the role the model can play as an analytical device designed to aid the decision maker. Topics treated include: simple regression and correlation, multiple regression and correlation, exponential smoothing, linear programming, network models, and simulation models.

Profs. Borack, Parsons, Wiseman, and Staff

Spring and Summer Qtrs.

**49.258 Accounting Systems and Data Processing** (Prereq. 49.101) 4 Cl.; 4 Q.H.

Concerned with information flows throughout the organization, the use of quantitative decision techniques in planning and control, the concept of the integrated and the total information systems, and the applications of computer programming to business, non-profit organizations, government, etc.

Mr. Grossman

Fall and Winter Qtrs.

**49.261 Quantitative Models in Operations Analysis**

(Prereq. 45.265) 4 Cl.; 4 Q.H.

Focuses on the use of quantitative models as a means of gaining insight into problems encountered in the management of complex systems. The course will draw upon the techniques of linear programming, integer programming, transportation method, dynamic programming, simulation, and network analysis. These techniques will be used in the following problem areas: capital investment, replacement, materials handling, line balancing, project scheduling, and planning and control.

Prof. Shore

Spring Qtr.

**49.262 Independent Study**

4 Q.H.

For students who have received approval on their proposal to undertake independent study in lieu of any course required in the various concentrations. Each Department considers proposals presented by students to its Independent Studies Committee for evaluation and approval. Each such proposal will consist of a detailed outline of the objectives and plan of study and will be accompanied by a supporting statement from the supervising faculty member under whose direction the study will take place.

A copy of the final report prepared by the student will be presented to the Departmental Independent Studies Committee. Further information about the Independent Studies Program can be obtained from the Department Chairmen and Area Coordinators.

CBA Faculty

All Quarters

## Education Foundations

**50.111 Social Science I**

3 Cl.; 3 Q.H.

Cultural Anthropology and Education. Theories and concepts in cultural anthropology will be studied with primary emphasis on their relevance to informal and formal aspects of educational processes. Considerable attention will be devoted to the study of cross-cultural materials in order to understand the educational process in different cultural milieus.

Prof. Durham

Fall Qtr.

**50.112 Social Science II**

3 Cl.; 3 Q.H.

Sociology and Education. The course involves sociological analysis of the educational enterprise in the United States and other technologically-advanced societies, including consideration of the socialization process, the formation of youth cultures, and the function of the schools in these contexts. Attention will be given to the study of the effects of stratification, ethnic, and racial factors on educational institutions, education and social change, and the school as a social system.

Prof. Brown

Winter Qtr.

**50.113 Social Science III**

3 Cl.; 3 Q.H.

Intergroup Relations and Education. Examination of theoretical and empirical materials relative to the problem of intergroup relations and prejudice. Particular attention will be paid to the role of education in the reduction of intergroup conflict.

Prof. Zalinger

Spring Qtr.

**50.121 Human Development and Learning I**

4 Cl.; 4 Q.H.

Developmental processes from prenatal life up to adolescence; theories of learning and personality, with research and case material covering major aspects of psychological development.

Prof. Nichols in charge

Fall and Winter Qtrs.

**50.131 Human Development and Learning II**

(Prereq. 50.121) 4 Cl.; 4 Q.H.

Continuation of Human Development and Learning I. Significant aspects of adolescence; physical, social, and psychological factors as they influence adolescent behavior.

Prof. Gulo

Spring and Summer Qtrs.

**50.141 Measurement and Evaluation**

(Prereq. 51.135) 4 Cl.; 4 Q.H.

The fundamentals of measurement; basic statistical concepts and techniques used; evaluation of standardized and teacher-made tests.

Staff

Spring and Summer Qtrs.

**50.151 Backgrounds of American Education**

4 Cl.; 4 Q.H.

Historical and philosophical foundations of American education beginning with old-world origins; development of American schools and educational thought from the Colonial period to the present with emphasis on major current issues in education.

Prof. Baptiste

Fall, Winter, and Spring Qtrs.

**50.161 Seminar in Group Process**

4 Cl.; 4 Q.H.

A study of the structure, dynamics, and function of face-to-face groups leading to learning about goal achievement and task-orientation in our society which operates mainly by committee or group instrumentation. A serious student should gain an understanding of the function of informal relationships within formal organizations, the various roles within groups, peer relationships, superior-subordinate relationships, authority and intimacy, and the inclusion and exclusion processes. Also involved is the aspect of self-understanding. An Education elective open to seniors only.

Prof. Pruce

Spring Qtr.

**50.162 Seminar in Early Childhood Development**

(Prereq. 50.121, 50.131) 4 Cl.; 4 Q.H.

The theory and research regarding the cognitive, personality and social development of children from birth to six years will be considered with respect to their implications for early childhood education. Various existing programs will be examined and new directions explored. An Education elective course open to juniors and seniors only.

Prof. Bernheim

Spring Qtr.

## Education—Instruction

**51.124 Modern Mathematics Curricula**

4 Cl.; 4 Q.H.

Mathematics curricula in junior and senior high schools, including experimental programs, presented in their historical setting.

Prof. McLean

Spring Qtr.

**51.131 Fundamentals of Arithmetic I**

4 Cl.; 4 Q.H.

Techniques of teaching arithmetic so that underlying principles are stressed. Topics are selected to serve as a foundation in mathematics appropriate for any elementary program. Topics considered are: deductive and inductive reasoning, numeration systems, elementary concepts of set theory, whole numbers and rational numbers and their properties, decimal numerals, linear equations, and inequalities.

Prof. Clark

Fall and Winter Qtrs.

**51.132 Fundamentals of Arithmetic II**

(Prereq. 51.131) 4 Cl.; 4 Q.H.

Continuation of Fundamentals of Arithmetic I. Topics considered are: rate, ratio and percent, informal geometry, elementary theorems and proofs, similarity and trigonometry, area of volume, elements of spherical geometry.

Prof. Clark

Spring and Summer Qtrs.

**51.135 Analysis of Teaching and Educational Process**

(Prereq. 50.131) 4 Cl.; 4 Q.H.

The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching function.

Staff

Fall and Winter Qtrs.

**51.139 Writing and the Teaching of Writing** (Prereq. 51.135) 4 Cl.; 4 Q.H.

A study of the logical and rhetorical bases of exposition and argumentative writing; the role of definition in exposition and argumentation; relationships of assumptions, assertions, and implications; the nature of proof in the sciences, social sciences, and the humanities; strategies of argumentation; the affective consequences of word choice and sentence structure.

Prof. Favat

Spring Qtr.

**51.140 Methods and Materials of Teaching Modern Languages I**

(Prereq. 51.135) 4 Cl.; 4 Q.H.

The most effective types of classroom activities, subject unit organization,

assignments, examinations, and teaching aids used in modern language; the role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instruction.

Prof. Petralia

Fall and Winter Qtrs.

**51.141 Elementary Education Compendium I** (Prereq. 51.135) 4 Cl.; 4 Q.H.

The curriculum is analyzed on the basis of the overall objectives of the American elementary school. Students evaluate and organize units of work which are appropriate to the level at which they plan to teach. The integrated approach to learning is emphasized, but the integrated approach to science, social studies, and language arts subjects is given special attention.

Prof. Lee in charge

Fall and Winter Qtrs.

**51.142 Elementary Education Compendium II** (Prereq. 51.141) 4 Cl.; 4 Q.H.

The objectives, activities, and methods of evaluation in the elementary school are continued with special attention to the areas of music, art, and physical education.

Prof. Lee in charge

Spring and Summer Qtrs.

**51.143 Methods and Materials of Teaching English**

(Prereq. 51.135) 4 Cl.; 4 Q.H.

An introduction to the structure and functions of language as they apply to the teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media.

Prof. Favat

Fall and Winter Qtrs.

**51.144 Methods and Materials of Teaching Modern Languages II**

(Prereq. 51.140) 4 Cl.; 4 Q.H.

Continuation of Methods and Materials of Teaching Modern Languages I.

Prof. Petralia

Spring and Summer Qtrs.

**51.145 Methods and Materials of Teaching Mathematics**

(Prereq. 51.135) 4 Cl.; 4 Q.H.

Theory and practice of teaching secondary mathematics, including a discussion and evaluation of instructional problems. Lesson planning and presentations by individual students will afford appropriate practice and serve as the medium of instruction.

Prof. McLean

Fall and Winter Qtrs.

**51.147 Methods and Materials of Teaching the Sciences**

(Prereq. 51.135) 4 Cl.; 4 Q.H.

The prospective science teacher is introduced to the following: the philosophies of science and their applicability in society and the secondary school; science curriculum development and application; and pertinent methods and materials in science education.

Prof. Miner

Fall and Winter Qtrs.



**51.149 Methods and Materials of Teaching Social Studies**

(Prereq. 51.135) 8 Cl.; 8 Q.H.

This is a field-oriented course conducted off-campus in one or more schools of cooperating public school systems where students engage with the pupils of the school individually and in small groups. Techniques of planning; development of curriculum materials; utilization of audio-visual equipment; simulations; development and implementation of evaluation instruments; presentation of original materials in class.

Prof. Tedesco

Fall and Winter Qtrs.

**51.151 Student Teaching and Seminar**

(Prereq. Meth. and Mat. course in major field) 8 Q.H.

Opportunity for observation and teaching under regular supervision; carried on daily for full quarter with seminar running concurrently.

Dean Haley in charge

Fall, Winter, and Spring Qtrs.

## Education—Reading

**54.126 Teaching Reading in Secondary Schools**

4 Cl.; 4 Q.H.

For English and Social Studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course. (One quarter)

Prof. Maguire

Spring Qtr.

**54.135 Fundamentals of Reading I**

4 Cl.; 5 Lab.; 6 Q.H.

The basic, introductory course in developmental reading for prospective elementary teachers. In the first term the emphasis will be on language and symbolic process as it relates to beginning reading. The word recognition and meanings growth areas will be studied in detail, as will some methods and techniques of testing and grouping. An introduction to some reading books and materials, methods of teaching and the psychology of learning to read. Tutorial work will begin with students.

Prof. Howards in charge

Fall and Winter Qtrs.

**54.136 Fundamentals of Reading II**

(Prereq. 54.135) 4 Cl.; 5 Lab.; 6 Q.H.

A continuation and extension of the first term. Study skills; speed and fluency growth areas. The tutorial work will be extended. Greater familiarity with books, materials, and methods will be achieved.

Prof. Howards in charge

Spring and Summer Qtrs.

**54.141 Remedial Reading**

(Prereq. 54.136)

For prospective teachers in the primary unit. This introductory course familiarizes the student with some of the most commonly known and met reading problems in the typical classroom as well as in the reading clinic; analysis and evaluation of the typical diagnoses of such problems; corrective programs; tutorial work with a retarded reader, with each student keeping a log or journal of his work with a particular reading problem.

Prof. Burg

Fall and Winter Qtrs.

**54.142 Linguistics and Reading**

(Prereq. 54.136) 4 Cl.; 4 Q.H.

For elementary level teachers (primary unit). The major objective is to translate the knowledge gathered from structural and descriptive linguistics into useful classroom instruction; which includes not only reading instruction, but basic instruction in the related language skills. The contributions, particularly of writers like Fries, Barnhart, Bloomfield, and LeFevre, will be analyzed and experimented with in a tutorial situation in order to derive from this approach its practical values for teaching.

Prof. Kaufman

Spring Qtr.

**54.151 Children's Literature**

(Prereq. 54.136) 4 Cl.; 4 Q.H.

For prospective teachers in the primary unit. A comprehensive survey and critical analysis of the books and materials available for basic reading instruction and for supplementary reading activities. After a massive review of the available literature for the children, especially in grades K-3, each student will be responsible for developing some material of his own for trial with subjects. The ultimate goal is to make the student aware of what is available and how to use it most effectively in a reading program.

Prof. Buffone

Spring Qtr.

## Education—Speech and Hearing

**55.121 Introduction to Special Education**

4 Cl.; 4 Q.H.

An introductory survey course which emphasizes the characteristics and needs of exceptional children and youth; recognition of exceptional children in the classroom, including: the trainable and educable retarded; emotionally disturbed; social-offender; brain-injured; speech-, hearing-, and language-impaired; the physically handicapped; the visually handicapped; and the gifted.

Staff

Fall and Winter Qtrs.

**55.122 Introduction to Speech and Hearing Therapy**

4 Cl.; 4 Q.H.

Normal language and speech development in children. Analysis of the most prevalent organic and functional communication disorders, with emphasis on identification techniques. Lectures, demonstrations, and 15 clock hours of observation in University clinic.

Prof. Ferullo

Spring and Summer Qtrs.

**55.124 Anatomy, Physiology, and Neurology of the Speech and Hearing Mechanism**

4 Cl.; 4 Q.H.

Physiological and mechanical components of speech and hearing. The skeletal, muscular, and nervous systems. Lectures and laboratory demonstrations.

Miss Walsh

Spring and Summer Qtrs.

**55.126 Communication Skills for the Teacher**

4 Cl.; 4 Q.H.

The importance of effective communication in the teaching profession. Utilization of the knowledge of the scientific principles of voice production with practice of effective vocal usage. Integration of communication skills with regular classroom curriculum. Lectures, exercises, demonstration, and observations.

Mrs. West

Fall and Winter Qtrs.



- 55.131 Development of Language and Speech** (Prereq. 55.122) 4 Cl.; 4 Q.H.  
 Analysis of theories related to concept formation, development and utilization of symbols from birth to maturation. Foundations and developmental phases of language and speech. The significance of physiological, neurological, psychological, and intellectual factors affecting language and speech development. Case studies, lectures, demonstration, and observations.  
 Prof. Ferullo Fall and Winter Qtrs.

- 55.133 Introduction to Linguistics and Phonetics** (Prereq. 55.122) 4 Cl.; 4 Q.H.  
 Learning and applying the International Phonetic Alphabet. A consideration of articulated phonemes and allophones, sound change, structural and descriptive linguistics applied to problems in communication. The nature of language. Lectures, demonstrations, and observations.  
 Mrs. West Fall and Winter Qtrs.

- 55.134 Organic Speech Disorders** (Prereq. 55.124) 4 Cl.; 4 Q.H.  
 Etiology, diagnosis, and prognosis of non-neurological communication disorders; consideration of therapeutic procedures in cleft-palate and cleft-lip, and related maxillo-facial abnormalities; laryngectomy; and tongue-thrusting. Lectures, observations, and demonstrations.  
 Prof. Ferullo Spring and Summer Qtrs.

- 55.141 Methods and Materials in Speech and Hearing** (Prereq. 51.135) 4 Cl.; 4 Q.H.  
 Various materials and methods used in the correction of speech problems. The rationale of the corrective process; selection, preparation, and presentation of materials. Speech correction and improvement through an integrated approach.  
 Prof. Johnston Fall and Winter Qtrs.

- 55.142 Introduction to Audiology** (Prereq. 55.124) 4 Cl.; 4 Q.H.  
 The physics of sound, anatomy, physiology, and neurology of the ear. Basic techniques in audiometric testing. Lectures, demonstrations, and observations.  
 Miss Walsh Spring and Summer Qtrs.

- 55.143 Diagnostic Techniques in Speech and Hearing** (Prereq. 55.134) 4 Cl.; 4 Q.H.  
 Diagnosis and therapy in communication disorders in children and adults; tests utilized in evaluation of individuals with language, speech, and hearing disorders. Demonstrations, case histories, and experience in University clinic.  
 Miss Walsh Fall and Winter Qtrs.

- 55.144 Clinical Practice in Speech and Hearing I** (Prereq. 55.131, 55.133) 2 Cl.; 6 (clinic) Lab.; 4 Q.H.  
 Practicum in language, speech, and hearing diagnosis and therapy in University clinic. Students should reserve a block of hours for clinic practicum. A minimum of 100 clock hours.  
 Mrs. Troutman Spring and Summer Qtrs.

- 55.145 Functional Speech Disorders** (Prereq. 55.124) 4 Cl.; 4 Q.H.  
 Etiology, diagnosis, and prognosis of communication disorders of non-organic origins. Language and speech disorders and the psychodynamics of personality development. Lectures and demonstrations, case histories, and experience in the University clinic.  
 Prof. Ferullo Fall and Winter Qtrs.
- 55.152 Speechreading and Auditory Training**  
 Various speechreading methods; an integrated approach to the treatment of hard-of-hearing individuals; auditory training techniques and materials.  
 Prof. Ferullo Spring Qtr.
- 55.154 Introduction to Stuttering** (Prereq. 55.145) 4 Cl.; 4 Q.H.  
 A consideration of some of the major theories of stuttering. Diagnosis and therapy procedures. Lectures, demonstrations, and observations.  
 Prof. Johnston Spring Qtr.
- 55.155 Clinical Practice in Speech and Hearing II**  
 (Prereq. 55.144 and 100 in University clinic) 2 Cl.; 6 (clinic) Lab.; 4 Q.H.  
 Practicum in language, speech, and hearing diagnosis in a medical and/or rehabilitation center; a multidisciplinary approach in the treatment of children and adults.  
 Mrs. Troutman Fall and Winter Qtrs.

## Physical Education

All courses are coeducational unless otherwise stated.

- 60.126 Physical Education Skills A** 2 Cl.; 2 Lab.; 2 Q.H.  
 Development of knowledge and skills necessary for competent performance in selected activities. Open only to transfer students.  
 Staff All Quarters
- 60.127 Physical Education Skills B** 2 Cl.; 2 Lab.; 2 Q.H.  
 Continuation of 60.126.  
 Staff All Quarters
- 60.131 Physical Education Skills IV** 2 Cl.; 4 Lab.; 3 Q.H.  
 Development of knowledge and skills necessary for competent performance in areas of badminton, folk, square and social dance, and gymnastics.  
 Staff Fall and Winter Qtrs.
- 60.132 Physical Education Skills V** 2 Cl.; 4 Lab.; 3 Q.H.  
 Development of knowledge and skills necessary for competent performance in areas of tennis, track and field, and life-saving skills.  
 Staff Spring and Summer Qtrs.
- 60.140 Analysis and Teaching of Physical Activities I**  
 (Prereq. 60.131) 2 Cl.; 4 Lab.; 3 Q.H.  
 Analysis of performance and methods of teaching in the areas of gymnastics and racquet sports.  
 Staff Fall Qtr.

**60.141 Analysis and Teaching of Physical Activities II**

(Prereq. 60.131) 2 Cl.; 4 Lab.; 3 Q.H.

Analysis of performance and methods of teaching in the areas of team sports (indoor) and aquatics.

Staff

Winter Qtr.

**60.142 Analysis and Teaching of Physical Activities III**

(Prereq. 60.132) 2 Cl.; 4 Lab.; 3 Q.H.

Analysis of performance and methods of teaching in the areas of field sports and dance.

Staff

Spring Qtr.

**60.143 Winter Sports**

1 Q.H.

Five-day resident session at North Conway, N.H. Participation according to ability in classes of Hannes Schneider Ski School. Evening seminars in skiing theory and teaching methods.

Miss Leathem

Winter Qtr.

**60.160 Instructional Technology**

2 Cl.; 2 Q.H.

Survey of selection, evaluation, preparation, and production of audio-visual media, instructional television, and programmed learning. Some opportunity to work with related equipment.

Prof. Donnelly and Staff

Fall Qtr.

**60.220 Program and Methods in Elementary School Physical Education Activities**

(Prereq. 19.102, 50.121, 50.131) 4 Cl.; 4 Q.H.

Philosophy, program-planning, and methods for teaching children; guided observation experiences with children in schools; individual teaching presentations and evaluations in basic motor skills, dance activities, games, gymnastics, and sports.

Staff

Winter Qtr.

**60.230 Advanced Teaching and Analysis**

(Prereq. 60.140, 60.141, 60.142) 2 Cl.; 4 Lab.; 3 Q.H.

Advanced study of teaching methods and analysis in *one* of the areas studied in Physical Education 60.140-42 and *one* individual sport.

Staff

Winter and Spring Qtrs.

**61.212 Handball and Squash**

3 Lab.; 1 Q.H.

The skills and techniques involved in the teaching of handball and squash; special emphasis on skills involved, rules, courtesies, and strategies in each sport.

Staff

Fall and Winter Qtrs.

**61.220 Survey of Recreational Sports**

3 Lab.; 1 Q.H.

Recreational activities as archery, deck tennis, table tennis, horseshoes; emphasis on rules, teaching techniques, place in the program.

Staff

Spring and Summer Qtrs.

**61.221 Volleyball and Badminton**

3 Lab.; 1 Q.H.

The theory and teaching of volleyball and badminton; special emphasis on rules, court and game courtesies, and strategies.

Prof. Wiseman

Fall and Winter Qtrs.

**61.230 Secondary School Dance**

3 Lab.; 1 Q.H.

The techniques of dance instruction at the junior and senior high school levels.

Staff

Fall and Winter Qtrs.

**61.235 Team Sports I**

1 Cl.; 2 Lab.; 2 Q.H.

The coaching of basketball and baseball to beginners; emphasis on role of head coach and assistant coach; organizing practice; the basic fundamentals of individual and team play.

Staff

Fall and Winter Qtrs.

**61.236 Team Sports II**

1 Cl.; 2 Lab.; 2 Q.H.

The coaching of football and track to beginners; role of head coach and assistant coach; organizing practice; the basic fundamentals of individual and team play.

Staff

Fall and Winter Qtrs.

**61.237 Team Sports III**

3 Lab.; 1 Q.H.

Techniques of teaching soccer, speedball and softball; special emphasis placed on rules, courtesies, and strategies.

Staff

Spring and Summer Qtrs.

**61.240 Introduction to Combatives**

3 Lab.; 1 Q.H.

The basic fundamentals, techniques, rules, and strategy in such combative activities as boxing, wrestling, judo, and combative games.

Staff

Fall and Winter Qtrs.

**61.241 Advanced Wrestling**

(Prereq. 61.240 or permission) 1 Cl.; 2 Lab.; 2 Q.H.

Advanced techniques in coaching wrestling at the senior high school and college levels; emphasis on fundamentals of a more advanced nature: care of athletes, officiating, conduct of meets.

Staff

Spring and Summer Qtrs.

**61.242 Advanced Boxing**

(Prereq. 61.240 or permission) 1 Cl.; 2 Lab.; 2 Q.H.

Advanced techniques in coaching, boxing; emphasis on offensive and defensive techniques, rules, and officiating.

Staff

Spring and Summer Qtrs.

**61.263 Methods and Materials in Physical Education**

(Prereq. 61.236 or permission) 4 Cl.; 4 Q.H.

Methods and materials to be used in curriculum development, class management, and teaching preparation for student teaching.

Staff

Fall and Winter Qtrs.

**61.265 Advanced Football**

(Prereq. 61.236 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques in coaching football at the senior high school and college levels; emphasis on individual and team play; offensive and defensive systems; role of head and assistant coaches; scouting; use of teaching aids; team management.

Staff

Spring and Summer Qtrs.

**61.266 Advanced Basketball**

(Prereq. 61.235 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques at the senior high school and college levels; emphasis on systems of offensive and defensive team play; scouting; use of teaching aids; team management.

Staff

Spring and Summer Qtrs.

**61.267 Advanced Baseball**

(Prereq. 61.235 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques in coaching baseball at the senior high school and college levels; emphasis on individual and team play; role of head and assistant coaches; team management.

Staff

Spring and Summer Qtrs.

**61.268 Advanced Track**

(Prereq. 61.236 or permission) 2 Cl.; 2 Lab.; 3 Q.H.

Basic techniques of coaching track and field at the senior high school and college levels; emphasis on care and training of athletes; practice schedules; coaching techniques; conduct of meets.

Staff

Spring and Summer Qtrs.

**61.280 Camp Leadership**

1 Cl.; 3 Lab.; 2 Q.H.

Introduction to the procedures of organized camping and outdoor activities; emphasis placed on camp skills; equipment; counseling; trip leadership; laboratory experiences.

Staff

Spring and Summer Qtrs.

**62.10A Beginning Swimming**

2 Lab.; 1 Q.H.

Instruction in basic swimming skills with emphasis on personal water safety.

Staff

All Quarters

**62.10B Intermediate Swimming** (Prereq. 62.10A or equivalent) 2 Lab.; 1 Q.H.

Instruction in basic and advanced swimming skills with emphasis on form and efficiency.

Staff

All Quarters

**62.10C Advanced Swimming** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.

Instruction in advanced swimming skills with emphasis on form and efficiency.

Staff

All Quarters

**62.10D Diving** (Prereq. 62.10A or equivalent) 2 Lab.; 1 Q.H.

Instruction in basic one meter and three meter springboard diving in all five categories of dives.

Staff

All Quarters

- 62.10E Competitive Swimming** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in the four competitive strokes, starts, and turns with emphasis on speed and conditioning.  
Staff Winter and Summer Qtrs.
- 62.10F Synchronized Swimming** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in basic synchronized swimming skills with emphasis on stunts, rhythmic swimming and choreography.  
Staff Winter and Spring Qtrs.
- 62.10G Water Polo** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in beginning water polo with emphasis on personal skill, offensive and defensive team play.  
Staff Fall and Spring Qtrs.
- 62.10H Water Skiing** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in basic water skiing techniques. (Ashland)  
Staff Summer Qtr.
- 62.10J Survey of Aquatic Activities**  
(Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Competitive swimming, diving, skin diving, synchronized swimming and water polo with emphasis on recreational values.  
Staff All Quarters
- 62.10K Senior Life Saving** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in life-saving skills, or techniques and theory; Red Cross certification possible.  
Staff All Quarters
- 62.10L Water Safety Instruction** (Prereq. 62.10B, 62.10K) 3 Lab.; 1 Q.H.  
Instruction in techniques, theory and teaching methods in swimming and life-saving courses; Red Cross Certification possible.  
Staff Spring Qtr.
- 62.10M Beginning Scuba** (Prereq. 62.10B or equivalent) 1 Cl.; 2 Lab.; 1 Q.H.  
Instruction in basic skin diving and scuba diving skills with emphasis on personal safety.  
Staff All Quarters
- 62.10P Canoeing** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in basic canoeing skills.  
Staff Summer and Fall Qtrs.
- 62.10Q Sailing** (Prereq. 62.10B or equivalent) 2 Lab.; 1 Q.H.  
Instruction in rowing and in basic sailing skills.  
Staff Summer and Fall Qtrs.

- 62.12A Beginning Folk and Square Dance** 2 Lab.; 1 Q.H.  
Introduction to folk and square dance at the beginning and intermediate levels.  
Staff Fall Qtr.
- 62.12B Intermediate Folk and Square Dance**  
(Prereq. 62.12A or equivalent) 2 Lab.; 1 Q.H.  
Instruction in folk and square dance at the intermediate and advanced levels.  
Staff Winter and Spring Qtrs.
- 62.12C Ethnic Dance Forms**  
(Prereq. 62.12A or Instructor's Consent) 2 Lab.; 1 Q.H.  
A study of primitive, folk and national dance forms.  
Staff Spring Qtr.
- 62.12E Beginning Modern Dance** 2 Lab.; 1 Q.H.  
Introduction to modern dance technique and improvisation.  
Staff Fall and Winter Qtrs.
- 62.12F Intermediate Modern Dance**  
(Prereq. 62.12E or equivalent) 2 Lab.; 1 Q.H.  
Intermediate modern dance technique and an introduction to the choreographic process.  
Staff Winter and Spring Qtrs.
- 62.12H Beginning Ballet** 2 Lab.; 1 Q.H.  
Beginning technique in classic ballet. (Does not fulfill completion of skill requirement in physical education major curriculum.)  
Staff Fall Qtr.
- 62.12J Intermediate/Advanced Ballet**  
(Prereq. 62.12H or equivalent) 2 Lab.; 1 Q.H.  
Intermediate to advanced technique in classic ballet.  
Staff Winter Qtr.
- 62.12L Modern Jazz Dance** 2 Lab.; 1 Q.H.  
Introduction to modern jazz dance technique. (Does not fulfill skill requirement in Physical Education major curriculum.)  
Staff Winter and Spring Qtrs.
- 62.13A Beginning Tumbling, Trampoline, and Hanging Apparatus** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in tumbling, trampoline and hanging apparatus at the beginning level.  
Staff Fall and Winter Qtrs.
- 62.13B Beginning Tumbling, Side Horse, and Vaulting** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in tumbling, side-horse, and vaulting at the beginning level. Men only.  
Staff Fall and Winter Qtrs.

**62.13C. Beginning Tumbling, Floor Exercise, Parallel and Horizontal Bars**

2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, floor exercise, parallel and horizontal bars at the beginning level. Men only.

Staff

Fall and Winter Qtrs.

**62.13D Beginning Tumbling, Balance Beam, Vaulting, and Uneven Bars**

2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, balance beam, vaulting and uneven parallel bars at the beginning level. Women only.

Staff

Fall and Winter Qtrs.

**62.13E Beginning Tumbling, Floor Exercise and Modern Gymnastics**

2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, floor exercise, and modern gymnastics at the beginning level. Women only.

Staff

Fall and Winter Qtrs.

**62.13F Intermediate Tumbling, Trampoline and Hanging Apparatus**

(Prereq. 62.13A or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, trampoline, and hanging apparatus at the intermediate to advanced levels.

Staff

Fall and Winter Qtrs.

**62.13G Intermediate Tumbling, Horse and Vaulting**

(Prereq. 62.13B or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, side-horse and vaulting at the intermediate-advanced level. Men only.

Staff

Fall and Winter Qtrs.

**62.13H Intermediate Tumbling, Floor Exercise, Parallel and Horizontal Bars**

(Prereq. 62.13C or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, floor exercise, parallel and horizontal bars at the intermediate to advanced level. Men only.

Staff

Fall and Winter Qtrs.

**62.13J Intermediate Tumbling, Floor Exercise and Modern Gymnastics**

(Prereq. 62.13E or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in tumbling, floor exercise, and modern gymnastics at the intermediate to advanced levels. Women only.

Staff

Fall and Winter Qtrs.



- 62.13K Intermediate Tumbling, Balance Beam, Vault and Uneven Bars**  
 (Prereq. 62.13D or equivalent) 2 Lab.; 1 Q.H.  
 Development of knowledge and skill necessary for competent performance in tumbling, balance beam, vaulting and uneven parallel bars at the intermediate to advanced levels. Women only.  
 Staff Fall and Winter Qtrs.
- 62.14A Beginning Badminton** 2 Lab.; 1 Q.H.  
 Instruction in beginning badminton skills, rules, strategy, and care of equipment.  
 Staff Spring and Summer Qtrs.
- 62.14B Beginning Squash Racquets** 2 Lab.; 1 Q.H.  
 Introduction to squash racquets at the beginning level; development of skills, rules, strategy, and etiquette.  
 Staff Fall and Winter Qtrs.
- 62.14C Beginning Tennis** 2 Lab.; 1 Q.H.  
 Instruction in beginning tennis skills, rules, strategy, and care of equipment.  
 Staff Spring and Summer Qtrs.
- 62.14D Indoor Tennis** 2 Lab.; 1 Q.H.  
 Introduction to tennis at the beginning level through the use of paddles and racquets in modified game situations; development of skill, rules, strategy and etiquette. (Does not fulfill skill requirement in Physical Education major curriculum.)  
 Staff All Quarters
- 62.14E Intermediate/Advanced Badminton**  
 (Prereq. 62.14A or equivalent) 2 Lab.; 1 Q.H.  
 Instruction in badminton including intermediate and advanced skills with emphasis on singles and doubles match play and strategy.  
 Staff Spring Qtr.
- 62.14G Intermediate/Advanced Tennis**  
 (Prereq. 62.14C or equivalent) 2 Lab.; 1 Q.H.  
 Instruction in tennis including intermediate and advanced skills with emphasis on singles and doubles match play and strategy.  
 Staff Summer Qtr.
- 62.15A Fundamentals of Movement** 2 Lab.; 1 Q.H.  
 Understanding and performance of basic motor and sports; efficient and effective movement for sports activities and daily living is stressed.  
 Staff Fall Qtr.
- 62.15B Beginning Archery** 2 Lab.; 1 Q.H.  
 Selected skills in target shooting and practical experience in archery games, novelty events, and conduct of tournaments.  
 Staff All Quarters

- 62.15D Beginning Bowling** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in bowling at the beginning level. Practice provided in nearby commercial alleys. Lab. fee.  
Staff All Quarters
- 62.15F Beginning Golf** 2 Lab.; 1 Q.H.  
Instruction in fundamental golf skills, knowledge of clubs and their uses, and rules and etiquette. Indoor only during winter season.  
Staff All Quarters
- 62.15G Intermediate/Advanced Golf**  
(Prereq. 62.15F or equivalent) 2 Lab.; 1 Q.H.  
Instruction in golf at the intermediate-advanced level. Emphasis is placed on course play, rules, and selection of equipment. Lab. fee.  
Staff Fall and Summer Qtrs.
- 62.15H Beginning Judo** 2 Lab.; 1 Q.H.  
A survey of the principles and fundamental skills of judo. Instruction is geared to the beginning and intermediate levels.  
Staff All Quarters
- 62.15J Beginning Boxing** 2 Lab.; 1 Q.H.  
Instruction in boxing at the beginning level; emphasis on offensive and defensive techniques, scoring, training and officiating. Open to men.  
Staff All Quarters
- 62.15K Beginning Wrestling** 2 Lab.; 1 Q.H.  
Beginning level of instruction in basic wrestling maneuvers. Fundamental breakdowns, escapes, takedown, rides, and pinning combinations are stressed. Rules and scoring procedures are discussed and modified matches are conducted. Open to men.  
Staff All Quarters
- 62.15L Intermediate/Advanced Wrestling**  
(Prereq. 62.15K or equivalent) 2 Lab.; 1 Q.H.  
Intermediate-advanced levels of instruction are presented. Emphasis is placed on training and training principles, selected skills not covered in beginning wrestling, scrimmages, and officiating. Open to men.  
Staff Fall and Winter Qtrs.
- 62.15M Beginning Fencing** 2 Lab.; 1 Q.H.  
Instruction in basic foil fencing skills including fundamental techniques of competition.  
Staff Spring Qtr.
- 62.15N Intermediate/Advanced Foil Fencing**  
(Prereq. 62.15M or equivalent) 2 Lab.; 1 Q.H.  
Instruction in intermediate-advanced techniques of foil fencing with special

emphasis on competition, judging, and the use of electrical equipment. Open to women.

Staff

Spring Qtr.

**62.15P Intermediate/Advanced Fencing (3 weapons)**

(Prereq. 62.15M or equivalent) 2 Lab.; 1 Q.H.

Instruction in intermediate-advanced techniques of foil, epee, and sabre fencing with special emphasis on competition, judging and the use of electrical equipment. Open to men.

Staff

Spring Qtr.

**62.16B Weight Training**

2 Lab.; 1 Q.H.

Introduction to the principles and use of resistive exercises; isotonic exercise (weights), isometric, and the appropriateness of each. Open to men.

Staff

Fall, Winter, and Spring Qtrs.

**62.16C Physical Conditioning**

2 Lab.; 1 Q.H.

Instruction in basic exercise and conditioning techniques. Special emphasis is placed on individual needs for exercise and activity; the relationships of diet and relaxation to exercise are discussed.

Staff

All Quarters

**62.16D Exercise and Figure Control**

2 Lab.; 1 Q.H.

Instruction and guidance in contouring, fitness, and poise. Open to women. (Does not fulfill skill requirement in Physical Education major curriculum.)

Staff

All Quarters

**62.16E Adapted Physical Education I**

(Prereq. medical permission) 2 Lab.; 1 Q.H.

A course designed for students whose physical activity program must be modified for medical reasons. Personalized instruction and programs are provided according to individual needs.

Staff

All Quarters

**62.16G Principles of Physical Activities and Conditioning** 1 Cl.; 2 Lab.; 2 Q.H.

Survey of the physiological principles, concepts, and applications of skills concerned with individual or group fitness programs. (Not open to Physical Education majors.)

Staff

All Quarters

**62.16H Ski Conditioning**

2 Lab.; 1 Q.H.

Instruction in skills and techniques for the development of strength, endurance, flexibility, and efficient use of body for skiing. (Does not fulfill skill requirement in Physical Education major curriculum.)

Staff

Fall and Winter Qtrs.

**62.16J Beginning Skiing and Winter Sports**

4 Lab.; 2 Q.H.

Instruction in fundamental techniques of skiing, skating, and tobogganing. Lab fee.

Staff

Winter Qtr.

**62.16K Intermediate/Advanced Skiing and Winter Sports**

(Prereq. 62.16J or equivalent) 4 Lab.; 2 Q.H.

Instruction in skiing and skating at the intermediate-advanced level. Emphasis placed on skills, teaching, techniques, and safety procedures. Lab. fee.  
Staff Winter Qtr.

**62.16L Beginning Track and Field**

2 Lab.; 1 Q.H.

Instruction in the fundamental skills in the various track and field events for men and women.  
Staff Spring Qtr.

**62.16M Intermediate/Advanced Track and Field**

(Prereq. 62.16L or equivalent) 2 Lab.; 1 Q.H.

Instruction in intermediate-advanced techniques in track and field events. Emphasis is placed on improvement of individual skills; techniques of officiating are discussed.  
Staff Spring and Summer Qtrs.

**62.16P Beginning Handball**

2 Lab.; 1 Q.H.

Development of knowledge and skills necessary for competent performance in handball at the beginning level. Open to men.  
Staff Fall and Winter Qtrs.

**62.16Q Intermediate/Advanced Handball**

(Prereq. 62.16P or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skills necessary for competent performance in handball at the intermediate to advanced levels. Open to men.  
Staff Winter Qtr.

**62.17C Beginning Basketball**

2 Lab.; 1 Q.H.

Development of knowledge and skills necessary for performance in basketball at the beginning level. Sections for men and women.  
Staff Fall and Winter Qtrs.

**62.17D Intermediate/Advanced Basketball**

(Prereq. 62.17C or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skills necessary for performance in basketball at the intermediate to advanced levels. Sections for men and women.  
Staff Fall and Winter Qtrs.

**62.17F Beginning Ice Hockey**

(Prereq. Consent of Instructor) 2 Lab. 1 Q.H.

Development of knowledge and skills necessary for performance in ice hockey at the beginning levels. Candidates must be able to skate forward and backward and cut right and left for admission. Open to men.  
Staff Fall and Winter Qtrs.

**62.17G Intermediate/Advanced Ice Hockey**

(Prereq. 62.17F or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skills necessary for performance in ice hockey at the intermediate to advanced levels. Open to men.  
Staff Fall and Winter Qtrs.

**62.17J Beginning Volleyball**

2 Lab.; 1 Q.H.

Development of knowledge and skill for performance in volleyball at the beginning level. Sections offered for men and women.

Staff

Fall and Winter Qtrs.

**62.17K Intermediate/Advanced Volleyball**

(Prereq. 62.17J or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skill for performance in volleyball at the intermediate to advanced levels. Sections offered for men and women.

Staff

Fall and Winter Qtrs.

**62.17L Beginning Field Hockey**

2 Lab.; 1 Q.H.

Development of knowledge and skill for competent performance in field hockey at the beginning level. Open to women.

Staff

Fall and Winter Qtrs.

**62.17M Intermediate Field Hockey**

(Prereq. 62.17L or equivalent) 2 Lab.; 1 Q.H.

Development of knowledge and skill for competent performance in field hockey at the intermediate to advanced levels. Open to women.

Staff

Fall and Winter Qtrs.

**62.17N Flag Football**

2 Lab.; 1 Q.H.

Development of fundamentals of football through non-contact work at the beginning level; position play, passing, catching, running. Open to men.

Staff

Fall and Winter Qtrs.

**62.17P Beginning Football**

2 Lab.; 1 Q.H.

Development of fundamental football skills and knowledge to the beginning level of competence. Open to men.

Staff

Fall and Winter Qtrs.

**62.17Q Intermediate/Advanced Football**

(Prereq. 62.17P or equivalent) 2 Lab.; 1 Q.H.

Development of football knowledge and skill necessary for competent performance in football at the intermediate to advanced levels. Open to men.

Staff

Fall and Winter Qtrs.

**62.18C Beginning Softball**

2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in softball at the beginning level.

Staff

Spring and Summer Qtrs.

**62.18D Intermediate/Advanced Softball**

(Prereq. 62.18C) 2 Lab.; 1 Q.H.

Development of knowledge and skill necessary for competent performance in softball at the intermediate to advanced level. Open to women.

Staff

Spring and Summer Qtrs.

- 62.18E Baseball** (Prereq. 62.18C or equivalent) 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in baseball at the intermediate to advanced levels. Open to men.  
Staff Spring and Summer Qtrs.
- 62.18G Beginning Lacrosse** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in lacrosse at the beginning level. Open to women.  
Staff Spring and Summer Qtrs.
- 62.18H Intermediate/Advanced Lacrosse** (Prereq. 62.18G or equivalent) 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in lacrosse at the intermediate to advanced levels. Open to women.  
Staff Spring and Summer Qtrs.
- 62.18J Beginning Lacrosse** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in lacrosse at the beginning level. Open to men.  
Staff Spring and Summer Qtrs.
- 62.18K Intermediate/Advanced Lacrosse** (Prereq. 62.18J or equivalent) 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in lacrosse at the intermediate to advanced levels. Open to men.  
Staff Spring and Summer Qtrs.
- 62.18M Beginning Soccer** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in soccer at the beginning level. Open to women.  
Staff Spring and Summer Qtrs.
- 62.18N Intermediate/Advanced Soccer** (Prereq. 62.18M or equivalent) 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in soccer at the intermediate to advanced levels. Open to women.  
Staff Spring and Summer Qtrs.
- 62.18Q Beginning Soccer** 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in soccer at the beginning level. Open to men.  
Staff Spring and Summer Qtrs.
- 62.18R Intermediate/Advanced Soccer** (Prereq. 62.18Q or equivalent) 2 Lab.; 1 Q.H.  
Development of knowledge and skill necessary for competent performance in soccer at the intermediate to advanced levels. Open to men.  
Staff Spring and Summer Qtrs.

- 62.18T Selected Field Sports** 2 Lab.; 1 Q.H.  
Development of knowledge and skill in speedball, speedaway, and flag football. Open to women.  
Staff Spring and Summer Qtrs.
- 62.18V Selected Field Sports** 2 Lab.; 1 Q.H.  
Development of knowledge and skill in speedball and speedaway. Open to men.  
Staff Spring and Summer Qtrs.
- 62.19A Early Childhood Motor Skill Development** 1 Cl.; 2 Lab.; 2 Q.H.  
A study of the development of fundamental motor patterns (run, catch, kick, strike, jump, throw) from age 0 to 10 years including perceptual motor organizations of vision, audition, and proprioception.  
Staff Fall and Winter Qtrs.
- 62.19B Games and Activities for Children** 1 Cl.; 2 Lab.; 2 Q.H.  
Introduction to simple ball games, running and tag games, self-testing activities, movement exploration, and rhythms appropriate for children. Course content appropriate for future parents, teachers, and youth leaders.  
Staff Fall and Winter Qtrs.
- 62.19D The Spectator and Sports (Pass/Fail)** 1 Cl.; 1 Q.H.  
Instruction in the understanding for enjoyment as a spectator of such sports as football, basketball, ice hockey.  
Staff All Quarters
- 62.19G Perceptual Motor Training Programs** 1 Cl.; 2 Lab.; 2 Q.H.  
An introduction to the role motor activities play in enhancing perceptual development. An examination of some current training programs: Frostig, Kephart, Doman-Delacato, Winter-Haven.  
Staff Spring Qtr.
- 62.201 Human Movement** 2 Cl.; 2 Lab.; 4 Q.H.  
An introduction to the nature and role of human movement and the analysis of skillful movement performance through participation and observation. Introduction to the objectives, literature, and organization of the profession of physical education.  
Staff Fall Qtr.
- 62.203 Practicum in Group Dynamics** (Prereq. 62.201) 4 Q.H.  
A three-week residence group living experience at the Warren Center. An introduction in group dynamics through selected activities, discussion, living and working together.  
Staff Spring Qtr.
- 62.204 Psychology of Sport** (Prereq. Consent of Instructor) 2 Cl.; 2 Q.H.  
The psychological analysis of behavioral patterns and interactions in individual and team sports; includes personality and motivation, competition and sportsmanship, the role of spectators.  
Staff Spring Qtr.



**62.206 First Aid**

1 Cl.; 2 Lab.; 2 Q.H.

First aid procedures recommended for the home, school, and community; emphasis on practices endorsed by the American Red Cross.

Staff

Spring Qtr.

**62.208 Sociology of Sport and Dance**

(Prereq. Consent of Instructor) 2 Cl.; 2 Q.H.

The study of sport and dance as a social institution including theories explaining the role of each in contemporary society, and the part of each in evolving societies.

Staff

Spring and Summer Qtrs.

**62.210 History and Principles of P.E.**

4 Cl.; 4 Q.H.

Preview of history of physical education; the place and function of physical education and society; identification of principles for development of sound programs.

Staff

Fall and Winter Qtrs.

**62.212 Theory of Coaching**

(Prereq. Consent of Instructor) 2 Cl.; 2 Q.H.

An analysis of learning principles, sociology, and psychology as applied to the coaching of individual, dual and team sports. Techniques and standards of squad recruitment, organization, leadership, and coaching ethics will be presented.

Staff

Fall and Winter Qtrs.

**62.215 Observation of Student Behavior**

2 Lab.; 2 Q.H.

The growth and development of elementary children and adolescents in physical education through direct observations and laboratory work with children.

Staff

Spring Qtr.

**62.217 Theory of Play**

2 Cl.; 2 Q.H.

The nature of play and a study of cross-cultural patterns of play. An investigation of selected theories of play including Huizinga, Caillois, Sutton-Smith, and Lee.

Staff

Fall and Winter Qtrs.

**62.218 Elementary School Activities I**

(Prereq. 50.121) 2 Cl.; 4 Lab.; 4 Q.H.

The development of knowledge and skill beyond the advanced beginning level in the following activities for elementary school children—dance, gymnastics, movement education, low organization games, lead-up games and aquatics. Analysis of elementary school children's performance and appropriate teaching techniques for the elementary school will be observed and applied through observations and lab experience.

Staff

Spring and Summer Qtrs.

**62.221 Perceptual-Motor Learning and Development**

(Prereq. 50.121) 3 Cl.; 3 Q.H.

Interrelationships of movement behavior and perceptual-motor organizations of vision, audition, proprioception and psycho-social effects of perception. A brief overview of major theories of learning as they apply to learning motor skills.

Staff

Fall and Winter Qtrs.



- 62.24A Coaching Competitive Swimming**  
 (Prereq. 62.10B or permission) 1 Cl.; 3 Lab.; 2 Q.H.  
 Instruction in the techniques, theory and coaching methods of competitive swimming and diving.  
 Staff Winter Qtr.
- 62.24B Swimming Analysis** (Prereq. 62.10B or permission) 1 Cl.; 3 Lab.; 2 Q.H.  
 Instruction in theory, analysis techniques and teaching methods in swimming.  
 Staff All Quarters
- 62.24C Smallcraft Analysis** (Prereq. 62.10Q) 1 Cl.; 3 Lab.; 2 Q.H.  
 Instruction in techniques, theory and teaching methods of small craft classes; Red Cross certification possible.  
 Staff Summer Qtr.
- 62.24E Analysis and Coaching of Men's Gymnastics**  
 (Prereq. 62.13G, 62.13H) 1 Cl.; 3 Lab.; 2 Q.H.  
 Skill analysis and coaching of men's gymnastics with emphasis on appropriate teaching methods and new trends, and judging.  
 Staff Fall and Winter Qtrs.
- 62.24F Analysis and Coaching of Women's Gymnastics**  
 (Prereq. 62.13K) 1 Cl.; 3 Lab.; 2 Q.H.  
 Skill analysis and coaching of women's gymnastics with emphasis on appropriate teaching methods and new trends.  
 Staff Fall and Winter Qtrs.
- 62.24G Advanced Analysis and Judging of Women's Gymnastics**  
 (Prereq. 62.24F) 1 Cl.; 3 Lab.; 2 Q.H.  
 Advanced skill analysis techniques and instruction in judging women's gymnastics leading toward a judging certification.  
 Staff Winter and Spring Qtrs.
- 62.24H Analysis and Coaching of Badminton**  
 (Prereq. 62.14E) 1 Cl.; 2 Lab.; 2 Q.H.  
 Analysis of performance and methods of teaching and coaching in badminton.  
 Staff Spring and Summer Qtrs.
- 62.24J Analysis and Coaching of Tennis**  
 (Prereq. 62.14G) 1 Cl.; 2 Lab.; 2 Q.H.  
 Analysis of performance and methods of teaching and coaching in tennis.  
 Staff Spring and Summer Qtrs.
- 62.24K Analysis and Coaching of Fencing**  
 (Prereq. 62.15N or 62.15P) 1 Cl.; 3 Lab.; 2 Q.H.  
 Advanced skill analysis and coaching of fencing. Special emphasis on current research and teaching methods of fencing.  
 Staff Winter and Spring Qtrs.

**62.24L Analysis and Coaching of Golf**

(Prereq. 62.15G or equivalent) 1 Cl.; 3 Lab.; 2 Q.H.

Advanced skill analysis and coaching of golf. Special emphasis on course play and teaching methods. Lab. fee.

Staff

Fall, Spring, Summer Qtrs.

**62.24M Analysis and Coaching of Track and Field**

(Prereq. 62.16M or equivalent) 1 Cl.; 3 Lab.; 2 Q.H.

Advanced skill analysis and coaching of all track and field skills. Special emphasis placed on the analysis of common movement patterns, teaching methods, and coaching techniques for the individual performer.

Staff

Spring and Summer Qtrs.

**62.24N Analysis and Coaching of Wrestling**

(Prereq. 62.15L or equivalent) 1 Cl.; 3 Lab.; 2 Q.H.

Analysis of performance and techniques of teaching selected wrestling skills are covered in detail. Application of research to methodology is stressed. Open to men.

Staff

Fall and Winter Qtrs.

**62.24P Analysis and Coaching of Baseball**

(Prereq. 62.18E) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching interscholastic and intercollegiate baseball; to include advanced skill analysis, position and team play, conditioning, practice organization and team management.

Staff

Fall and Spring Qtrs.

**62.24Q Analysis and Coaching of Basketball**

(Prereq. 62.17C) 1 Cl.; 2 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching interscholastic and intercollegiate basketball; to include advanced skill analysis, position and team play, conditioning, practice organization and team management.

Staff

Fall and Winter Qtrs.

**62.24R Analysis and Coaching of Field Hockey**

(Prereq. 62.17K) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate field hockey; to include advanced skill analysis, position and team play, conditioning, practice organization and team management. Open to women.

Staff

Fall and Spring Qtrs.

**62.24S Analysis and Coaching of Football**

(Prereq. 62.17Q) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching interscholastic and intercollegiate football; to include advanced skill analysis, team conditioning, offensive and defensive systems, practice organization, team management and coaching staff organization. Open to men.

Staff

Fall and Spring Qtrs.

**62.24T Analysis and Coaching of Handball**

(Prereq. 62.16Q) 1 Cl.; 2 Lab.; 2 Q.H.

Primarily for students in secondary concentration. Advanced skill analysis and coaching; current practices. Open to men.

Staff Winter Qtr.

**62.24U Analysis and Coaching of Ice Hockey**

(Prereq. 62.17G) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching interscholastic and intercollegiate ice hockey; to include advanced skill analysis, position and team play, conditioning, practice organization and team management. Open to men.

Staff Winter Qtr.

**62.24V Analysis and Coaching of Lacrosse**

(Prereq. 62.18A or 62.18K) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate lacrosse; to include advanced skill analysis, position and team play, conditioning, practice organization and team management.

Staff Spring and Summer Qtrs.

**62.24W Analysis and Coaching of Soccer**

(Prereq. 62.18N or 62.18R) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate soccer; to include advanced skill analysis, position and team play, conditioning, practice organization and team management.

Staff Spring and Summer Qtrs.

**62.24X Analysis and Coaching of Softball** (Prereq. 62.18D) 1 Cl.; 3 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate softball; to include advanced skill analysis, position and team play, conditioning, practice organization and team management. Open to women.

Staff Spring and Summer Qtrs.

**62.24Y Analysis and Coaching of Volleyball**

(Prereq. 62.17J) 1 Cl.; 2 Lab.; 2 Q.H.

The basic techniques and responsibilities of coaching intramural, interscholastic, and intercollegiate volleyball; to include advanced skill analysis, position and team play, conditioning, practice organization and team management.

Staff Fall and Winter Qtrs.

**62.249 Physical Science Foundations**

3 Cl.; 3 Q.H.

A treatment of basic concepts and fundamentals of chemistry and physics as applied to human physiology and movement.

Staff Spring Qtr.

- 62.250 Anatomy and Physiology I** 3 Cl.; 2 Lab.; 4 Q.H.  
Gross anatomy and physiology of the human skeletal, joint, and muscular systems.  
Staff Fall and Winter Qtrs.
- 62.251 Anatomy and Physiology II**  
(Prereq. 62.250 or permission) 3 Cl.; 2 Lab.; 4 Q.H.  
Gross anatomy and physiology of the human nervous and circulatory systems.  
Staff Spring and Summer Qtrs.
- 62.252 Anatomy and Physiology III**  
(Prereq. 62.251 or permission) 3 Cl.; 2 Lab.; 4 Q.H.  
Gross anatomy and physiology of the human endocrine, respiratory, digestive, and urinary systems.  
Staff Fall and Winter Qtrs.
- 62.253 Kinesiology** (Prereq. 62.250, 62.251) 4 Cl.; 4 Q.H.  
Science of human motion; anatomic, mechanical, and physiological principles as they relate to an understanding of skillful, efficient, and purposeful human motion.  
Staff Fall and Spring Qtrs.
- 62.254 Exercise Physiology** (Prereq. 62.253) 3 Cl.; 2 Lab.; 4 Q.H.  
Study of the immediate and long-range effects of exercise upon the human body with emphasis on muscles, circulation, respiration, and metabolism; the scientific foundations of physical fitness; survey of related research.  
Staff Fall, Winter and Summer Qtrs.
- 62.255 Adapted Physical Education**  
(Prereq. 62.251, 50.131) 3 Cl.; 2 Lab.; 4 Q.H.  
Examination techniques for recognition of atypical conditions; characteristics and problems of the atypical; selection and adaption of physical activities to meet individual needs.  
Staff Fall, Winter and Summer Qtrs.
- 62.256 Athletic Training and Conditioning** 2 Cl.; 2 Lab.; 3 Q.H.  
The training and conditioning procedures in athletic programs; special emphasis on the prevention of athletic injuries; role of the trainer, athlete, coach, and health service.  
Staff Fall, Winter and Summer Qtrs.
- 62.257 Advanced Athletic Training** (Prereq. 62.256) 3 Cl.; 2 Lab.; 4 Q.H.  
The advanced preparation and utilization of programs of conditioning and administration for prevention and care of injuries associated with competitive athletics.  
Staff Fall and Winter Qtrs.
- 62.260 Measurement and Evaluation** 4 Cl.; 4 Q.H.  
Construction, use, selection, and interpretation of evaluative tools applicable to physical education; elementary statistical methods.  
Staff Fall and Winter Qtrs.

- 62.270 Administration of Physical Education** (Prereq. 62.210) 4 Cl.; 4 Q.H.  
The organization and administration of programs in physical education with emphasis on the elementary and secondary school program.  
Staff Spring Qtr.
- 62.273 Sports Officiating** 1 Cl.; 3 Lab.; 2 Q.H.  
Theory, practice, and techniques of officiating. (Choices of: basketball, volleyball, baseball, soccer, football, ice hockey, lacrosse). Open to men.  
Staff All Quarters
- 62.274 Sports Officiating** 1 Cl.; 3 Lab.; 2 Q.H.  
Theory, practice, and techniques of officiating. (Choices of: basketball, volleyball, softball, soccer, field hockey, lacrosse). Open to women.  
Staff All Quarters
- 62.275 Critical Teaching Skills** 3 Cl.; 3 Q.H.  
Experience using the taxonomies of educational objectives to write, conduct, and evaluate educational and behavioral objectives. Analysis of direct and indirect, verbal and nonverbal teaching behavior for classroom and activity teaching to be studied by micro-teaching, simulation and interaction analysis techniques.  
Staff Fall and Winter Qtrs.
- 62.277 Outdoor Teaching Lab** 2 Q.H.  
A three-week resident summer practicum at the Warren Center. Provides opportunities for assumption of counseling, teaching, and leadership roles in special camp programs, land sports, nature, pioneering, arts and crafts, and aquatics. Youngsters of various ages from the Boston area are assigned in residence as subject campers.  
Staff Summer Qtr.
- 62.280 Curriculum Development** (Prereq. 62.275 or Consent of Instructor) 3 Cl.; 3 Q.H.  
Basic foundations of curriculum development stressing fundamental principles and guides to curriculum organization, format, and evaluation. Survey of existing curricula and the development of an understanding of current curriculum trends.  
Staff Spring Qtr.
- 62.282 Supervised Student Teaching** 8 Q.H.  
Assignment to public school(s) for observation and practice teaching under the guidance of a cooperating teacher and a college supervisor. Association with the main duties assumed by physical education teachers including coaching and/or intramural organization and supervision; individual conferences and seminars.  
Staff Fall and Winter Qtrs.
- 62.283 Advanced Modern Dance Technique and Composition** (Prereq. 62.12F or Consent of Instructor) 1 Cl.; 4 Lab.; 3 Q.H.  
Advanced modern dance technique and an analysis of composition structure and thematic content.  
Staff Spring Qtr.

**62.284 Dance History and Philosophy**

4 Cl.; 4 Q.H.

A survey of dance from ancient times to the present. Consideration of dance as an art form in relation to other art forms and of dance as an educational discipline.

Staff

Spring Qtr.

**62.286 Dance: Choreography and Production**

1 Cl.; 4 Lab.; 4 Q.H.

Choreography for trio, quartet and large groups based upon the projection of an idea or mood. Theory and practice in the staging of student choreography including lighting, costuming, scenery, and make-up.

Staff

Winter Qtr.

**62.288 Recreational Dance** (Prereq. 62.12B or equivalent) 1 Cl.; 2 Lab.; 2 Q.H.

Theory and practice of the methods and materials in the teaching of recreational dance forms at the primary and secondary levels.

Staff

Spring Qtr.

**62.289 Creative Dance** (Prereq. 62.12F or equivalent) 1 Cl.; 2 Lab.; 2 Q.H.

Theory and practice of methods and materials in the teaching of creative dance. Examination of the aims and responsibilities of dance education at the primary and secondary levels.

Staff

Winter and Spring Qtrs.

**62.291, 62.292, 62.293 Special Problems**

(Prereq. permission from Dept. chairman) 2, 3, or 4 Q.H.

Independent investigation of physical education in an area of each student's interests. The investigation will be supervised by an appointed faculty member and will culminate with a formal written report.

Staff

All Quarters

## Recreation Education

**63.120 Professional Orientation to Recreation**

2 Cl.; 2Q.H.

Philosophy and scope of modern recreation and its role in society. Discussion of opportunities at home and abroad in school and community settings, in agencies, hospitals, institutions, and industries. Focus on goals for American recreation. (Includes unit on study habits.)

Prof. Robinson

Fall Qtr.

**63.121 Recreation Skills I**

6 Lab.; 2 Q.H.

Skill development and participation in the recreational activities: tumbling, volleyball, badminton, Red Cross swimming skills, guitar and piano.

Prof. Haché and Miss Eliopoulos

Fall Qtr.

**63.122 Recreation Skills II**

2 Cl.; 6 Lab.; 4 Q.H.

Skill development and participation in gymnastics, folk dance, music analysis, song leading, and instrumental accompaniment. (Includes unit on practical mathematics.)

Prof. Haché and Miss Eliopoulos

Winter Qtr.

**63.123 Recreation Skills III**

2 Cl.; 6 Lab.; 4 Q.H.

Development of leadership skill in social recreation activities: singing, folk dance, games, and party program-planning including leadership experiences with groups. Counselor education—philosophy and leadership methods in camping. Red Cross lifesaving course. (Includes unit on business mathematics.)

Miss Eliopoulos and Staff

Spring Qtr.

**63.125 Outdoor Education and Camp Leadership**

4 Q.H.

A two-week resident summer session at Warren Center and in Maine: includes Natural Science, Aquatics, Overnight Camping, Indian lore, ACA Campcraft certification, leadership in special camp programs, outdoor sports, smallcraft training, and arts and crafts.

Miss Glancy and Staff

Summer Qtr.

**63.126 Outdoor Education I**

3 Lab.; 1 Q.H.

Interpretation of natural science and ecology. Emphasis on the development of personal skills through laboratory, field trips, lectures, learning experiences in the out-of-doors.

Prof. Jeffrey and Staff

Fall and Winter Qtrs.

**63.127 Outdoor Education II**

1 Cl.; 3 Lab.; 2 Q.H.

Emphasis in developing understanding, interest, and field biology skills for economy, conservation, and recreation. Includes wildlife management, forestry, horticulture, and animal husbandry.

Prof. Jeffrey and Staff

Spring and Summer Qtrs.

**63.128 Survey of Outdoor Recreation and Park Facilities**

3 Cl.; 3 Q.H.

Fundamental management and administration concepts for a wide variety of outdoor areas and facilities such as parks, beaches, ice rinks, marinas, and camps.

Prof. Jeffrey and Staff

Spring and Winter Qtrs.

**63.129 School Camping — Organization and Administration**

3 Cl.; 3 Q.H.

Administration and leadership in school outdoor education and conservation programs in the natural environment. Field trips and laboratory includes experience with school-age groups.

Prof. Jeffrey and Staff

Spring Qtr.

**63.131 Techniques of Recreation Leadership**

1 Cl.; 6 Lab.; 3 Q.H.

Study and practical experience in a diversity of group programs and processes; i.e., workshops, committees, clubs, informal gatherings, recreational programs for school, camp, and community, field trips.

Profs. Robinson and Morrison

Fall and Winter Qtrs.

**63.132 Interagency Planning for Community Action**

3 Cl.; 3 Q.H.

Agencies and how they function (program and personnel); how agencies cooperate for interagency programming. Legal and financial aspects and their effect on program.

Prof. Robinson

Fall and Winter Qtrs.



- 63.133 Recreation Skills IV** 6 Lab.; 2 Q.H.  
Development of skills and teaching techniques in basketball, both men's and women's. Techniques of teaching volleyball and badminton. Survey of recreational swimming skills including participation. Techniques of leadership in aquatic games, competitive swimming and synchronized swimming.  
Miss Glancy Fall and Winter Qtrs.
- 63.134 Recreation Skills V** 6 Lab.; 2 Q.H.  
Techniques of teaching tennis and gymnastics. Red Cross Standard and Advanced First Aid.  
Miss Glancy Spring and Summer Qtrs.
- 63.135 Social Recreation** 2 Cl.; 2 Q.H.  
Techniques of leadership, participation, planning for recreation in social settings for all ages—parties, programs, and special events. Repertoire—mixers, dances, games, songs, and skits. Creativity stressed. For non-recreation majors.  
Miss Eliopoulos Spring Qtr.
- 63.143 Winter Sports** 1 Q.H.  
Five-day resident session. Participation according to ability. Evening seminars in skiing theory and teaching methods.  
Miss Glancy Winter Qtr.
- 63.146 Camp Administration** 3 Cl.; 3 Q.H.  
Major problems involved in the establishment and operation of organized camps, including school camps, summer camps, and day camps. Selection of camp sites: sanitation, program, schedule, training personnel, finances, good management, and promotion.  
Prof. Jeffrey Fall and Winter Qtrs.
- 63.147 Outdoor Education for Handicapped** 3 Cl.; 3 Q.H.  
Technical training and experiences with adapted recreation and education for exceptional and handicapped age groups.  
Prof. Robinson and Staff Spring Qtr.
- 63.148 Introduction to Mountaineering** 4 Cl.; 4 Q.H.  
All aspects of mountaineering, exposing students to the physical, emotional, and intellectual challenges afforded by technical mountaineering. An interdisciplinary study drawing upon social, physical and natural sciences such as physical, political and economic geography; glaciology, meteorology; structural geology, physiology and social psychology, etc. Basic skills will be developed in friction and technical climbing, route finding, navigation, expedition planning and wilderness living. The course includes a technical rock climbing laboratory and a two day mini-expedition in the Northern Presidential Range.  
Mr. Lyman All Quarters
- 63.150 Anatomy and Physiology I** 2 Cl.; 2 Lab.; 3 Q.H.  
Gross anatomy and physiology of the human skeletal, articular, muscular and nervous systems; implications for recreation programs.  
Prof. Larson Fall and Winter Qtrs.



- 63.151 Anatomy and Physiology II** 2 Cl.; 2 Lab.; 3 Q.H.  
Gross anatomy and physiology of the human endocrine, circulatory, respiratory, digestive and urinary systems; implications for recreation programs.  
Prof. Larson Spring and Summer Qtrs.
- 63.160 Development and Utilization of Recreation Education Resources** 3 Cl.; 3 Q.H.  
Survey of field and audio-visual education and resources; instruction and practice in use of equipment and materials; collection and processing of Recreation Development Center resources.  
Prof. Robinson and Staff Spring and Summer Qtrs.
- 63.210 Philosophy of Recreation and Leisure** (Prereq. 63.120) 3 Cl.; 3 Q.H.  
Goals for American recreation studied in modern context; implications for the profession; historical background, concepts of work, leisure, recreation; trends, issues, and future directions.  
Prof. McCay Fall and Winter Qtrs.
- 63.215 Trends and Issues in Recreation** 3 Cl.; 3 Q.H.  
For non-majors in recreation. National and international issues and trends in the professional field; trends in participation with professional implications; emerging programs; legislation; the leader and the future.  
Prof. McCay Spring Qtr.
- 63.220 Methods and Materials in Recreation** 3 Cl.; 3 Q.H.  
Philosophy, program planning, motivational techniques, methods of teaching and organizing materials and groups, utilization of equipment.  
Profs. Robinson and Morrison Fall and Winter Qtrs.
- 63.240 Dance and the Cultures** 2 Cl.; 3 Lab.; 3 Q.H.  
Folk dance and the related arts; emphasis on cultural understanding and appreciation through dance, music, arts, crafts, customs, foods, dress, history, and traditions.  
Miss Glancy and Staff Fall and Winter Qtrs.
- 63.250 Group Dynamics** 3 Cl.; 3 Q.H.  
The group process; how groups arrive at group identity; factors influencing size, purpose, behavior patterns, selection of individual members; training, and experience in leadership techniques.  
Miss Casavant Fall and Winter Qtrs.
- 63.255 Introduction to Therapeutic Recreation Service** 3 Cl.; 3 Q.H.  
Concentrated study of recreation service for those who are ill or disabled. Inquiry into the elements of therapeutic recreation service; current treatment and care patterns; the nature of disability; how recreation service is related to disability.  
Prof. Robinson Fall and Winter Qtrs.

- 63.256 Workshop in Adapted and Hospital Recreation** 3 Cl.; 3 Q.H.  
Investigation in depth of basic and recent developments in adaptive and hospital recreation. Reports, discussions, observations, and visitations.  
Prof. Robinson Spring Qtr.
- 63.257 Recreation Activities for Atypical Individuals and Groups** 3 Cl.; 3 Q.H.  
Adaptation of recreational activities to meet the needs of handicapped individuals in hospitals and other organizations offering recreational programs for handicapped. Emphasis on the basic principles of recreational therapy.  
Prof. Robinson Fall and Winter Qtrs.
- 62.260 Organization and Administration of Recreation and Parks** 3 Cl.; 3 Q.H.  
Financial support and management; promotion; budgeting; personnel policies; arrangements and facilities; underlying principles and contemporary patterns.  
Profs. Robinson and Morrison Fall and Winter Qtrs.
- 63.265 Techniques of Supervision and Evaluation**  
(Prereq. Basic Math. and 63.250) 3 Cl.; 3 Q.H.  
Current methods and materials; observation of recreation programs, supervision and evaluation; in service education; appraisal, measurement, evaluation.  
Profs. Robinson and Morrison Spring Qtr.
- 63.266 Community Education and Better Schools** 3 Cl.; 3 Q.H.  
The place of the school in community recreation. Special emphasis on the schools' twelve month program to meet the needs of all ages. Field programs dealing with the community-school concept.  
Prof. McCay Spring Qtr.
- 63.267 Introduction to Youth Groups** 3 Cl.; 3 Q.H.  
Philosophy, history, and programs of various youth clubs. Boys Clubs, YMCA's, YWCA's and other organizations offering programs for the youth.  
Prof. Morrison Fall and Winter Qtrs.
- 63.270 Arts and Crafts** 1 Cl.; 6 Lab.; 3 Q.H.  
Opportunities to learn and to teach in various media—clay, paper, crayon, paint, print, leather, wood, metal, yarn, natural and scrap materials; emphasis on creativity, skill, and enjoyment for all ages.  
Miss Glancy Fall and Winter Qtrs.
- 63.280 Supervised Field Experience and Teaching** 16 Q.H.  
Equivalent to student teaching in education, professional assignment in recreation setting; i.e., industry, center, school, hospital, agency, organization, housing, settlement, park, playground, camp. Supervision and conferences. Seminar.  
Prof. McCay and Staff Spring and Summer Qtrs.
- 63.285 Research and Readings in Recreation** 4 Cl.; 4 Q.H.  
Survey of research; elementary techniques of research; review of current literature in the field.  
Prof. Morrison Spring Qtr.

- 63.290 Guided Independent Study in Recreation Service** 4 Cl.; 4 Q.H.  
 Development and implementation of a project in recreation service under faculty supervision. Each student will design, carry out, and prepare a written report of his project.  
 Prof. Morrison Fall and Winter Qtrs.

## Physical Therapy

- 64.111 Introduction to Physical Therapy** 1 Cl.; 1 Lab.; 1 Q.H.  
 Orientation to the field of physical therapy and its role in the health professions. Basic nursing procedures.  
 Miss Foster Winter Qtr.
- 64.112 Introduction to Physical Therapy**  
 (Prereq. 64.111) 1 Cl.; 1 Lab.; 1 Q.H.  
 Theory and practice in body mechanics, postural examinations, and patient management.  
 Mrs. Torgerson Spring Qtr.
- 64.121 Gross Anatomy** (Prereq. 18.142, 18.148) 4 Cl.; 3 Lab.; 5 Q.H.  
 The structure and functions of the human body with particular emphasis on the skeletal, muscular, and nervous system. Lecture and laboratory with dissection.  
 Prof. Powers and Miss Foster Fall Qtr.
- 64.131 Applied Anatomy** (Prereq. 64.121, 11.172) 3 Cl.; 3 Lab.; 4 Q.H.  
 A further study of neuromuscular function with emphasis on the mechanical and physiological factors involved; application to normal and pathological movement. Physiology of exercise included.  
 Mrs. Watkins Winter Qtr.
- 64.143 Physical Therapy I** (Prereq. 64.121) 2 Cl.; 6 Lab.; 5 Q.H.  
 Theory, demonstration, and practice in massage, manual muscle testing and individual muscle re-education.  
 Prof. Van Slyck and Miss Foster Winter Qtr.
- 64.154 Physical Therapy II** (Prereq. 64.131, 64.143) 1 Cl.; 4 Lab.; 3 Q.H.  
 Theory, demonstration, and practice in basic therapeutic exercise. Theory, demonstration and practice of amputee training and prosthetic devices.  
 Prof. Van Slyck and Miss Foster Spring Qtr.
- 64.155 Physical Therapy III** (Prereq. 64.131, 64.143) 2 Cl.; 2 Lab.; 3 Q.H.  
 Theory, demonstration, and practice in functional activities and goniometry. Theory, demonstration, and practice in heat, light and hydrotherapy.  
 Prof. Cerasoli and Miss Foster Spring Qtr.
- 64.164 Physical Therapy IV** (Prereq. 64.154, 64.155) 4 Lab.; 2 Q.H.  
 Theory, demonstration, and practice in advanced therapeutic exercise.  
 Prof. Van Slyck Fall Qtr.

**64.165 Professional Literature and Research**

(Prereq. 64.154, 64.155) 1 Cl.; 2 Q.H.

Professional literature through Journal Club; introduction to scientific methodology and preparation of an independent research proposal.

Prof. Cerasoli and Mrs. Watkins

Fall Qtr.

**64.166 Rehabilitation**

(Prereq. 64.154, 64.155) 1 Cl.; 1 Q.H.

Seminar on the concepts of rehabilitation presented by allied health personnel throughout the community. Student discussion relating the physical therapist's role to the health team.

Mrs. Watkins

Fall Qtr.

**64.171 Physical Therapy V**

(Prereq. 64.154, 64.155) 1 Cl.; 2 Lab.; 2 Q.H.

Theory, demonstration, and practice in the physical therapy management of medical and surgical chest disorders.

Prof. Cerasoli

Winter Qtr.

**64.172 Physical Therapy VI**

(Prereq. 64.154, 64.155) 2 Cl.; 2 Lab.; 3 Q.H.

Theory, demonstration, and practice in electrical muscle stimulation and testing procedures.

Prof. Shaffer

Fall Qtr.

**64.174 Physical Therapy VII**

(Prereq. 64.154, 64.155, 64.164) 1 Cl.; 2 Lab.; 2 Q.H.

Continuum of 64.164.

Prof. Van Slyck

Winter Qtr.

**64.175 Ethics and Administration**

(Prereq. 64.164) 2 Cl.; 2 Q.H.

Principles and methods in administrative and supervisory responsibilities; emphasis on development of desirable personal and professional attitudes and interpersonal relations.

Prof. Carlisle

Winter Qtr.

**64.185 Supervised Clinical Practice I**

(Prereq. satisfactory attainment in all prior professional courses) 6 Q.H.

Supervised clinical experience in various physical therapy departments in the Boston area, including weekly clinical seminars.

Profs. Shaffer, Cerasoli, and Clinical Faculty

Fall Qtr.

**64.195 Supervised Clinical Practice II**

(Prereq. satisfactory attainment in all professional courses) 8 Q.H.

Advanced supervised clinical experience on a full-time basis; assignments in Massachusetts and other states.

Profs. Shaffer, Cerasoli, and Clinical Faculty

**64.210 Pathology**

(Prereq. 64.121) 3 Cl.; 3 Q.H.

Lectures and demonstrations of pathological gross specimens; inflammation; repair; infection; immunity and hypersensitivity; degenerative processes; disturbances of metabolism and circulation; disorders of growth, including tumors.

Gherardo J. Gherardi, M.D.

Winter Qtr.

- 64.220 Clinical Medicine I** (Prereq. 64.121) 2 Cl.; 2 Q.H.  
Lectures covering the various area of medicine and surgery related to conditions commonly encountered in patients treated by the physical therapist; pediatrics, general medicine, general surgery.  
Sidney Koretsky, M.D. Winter Qtr.
- 64.221 Clinical Medicine II** (Prereq. 64.220) 3 Cl.; 3 Q.H.  
A continuation of Clinical Medicine 64.220. Orthopedic conditions; thoracic surgery; role of the laboratory.  
Henry H. Banks, M.D. and Associates Spring Qtr.
- 64.222 Clinical Medicine III** (Prereq. 64.220, 64.221) 3 Cl.; 3 Q.H.  
A continuation of Clinical Medicine 64.220. Clinical Neurology and Neurosurgery; plastic surgery; burns; dermatology; gynecology; urology.  
John J. Sullivan, M.D. and Associates Winter Qtr.
- 64.235 Psychiatry** (Prereq. 19.102, 19.140) 3 Cl.; 3 Q.H.  
Modern psychiatric methods of diagnosis and treatment with special emphasis on those conditions with which the physical therapist is concerned.  
Arthur W. McMahon, Jr., M.D. Spring Qtr.
- 64.246 Applied Physiology** (Prereq. Physiol. I and II, 64.165) 2 Cl.; 4 Lab.; 4 Q.H.  
Implementation of independent research proposals. Effect on the physiological processes of the body produced by basic treatment and testing procedures of physical therapy; modifications due to pathological changes. Patient presentation included.  
James I. Porter, M.D. and Prof. Cerasoli Winter Qtr.
- 64.250 Neuroanatomy** (Prereq. 64.131) 3 Cl.; 3 Q.H.  
Morphological and functional management of the nervous system; derangement of normal structure and function of the nervous system in various diseases. Lecture and laboratory with dissection.  
Prof. Powers Spring Qtr.

## Health Education

- 65.118 Drug Use and Abuse** 4 Cl.; 4 Q.H.  
The use and abuse of modern drugs in our society including prescription and non-prescription drugs, alcohol and tobacco, and their physiological and psychological effects on the body; the social problems surrounding drug abuse including various approaches to drug education in school programs.  
Staff Fall Qtr.
- 65.129 Health Education** 3 Cl.; 3 Q.H.  
Principles of personal health; emphasis upon information pertinent to mental and physical well-being, current social behavior, and effective approaches to college living.  
Staff Fall and Spring Qtrs.

- 65.130 Health Problems of the College Student** 3 Cl.; 3 Q.H.  
 Discussion of the major health problems affecting college students. Principles of personal health with emphasis on healthful college living. Physical Education majors only.  
 Staff Spring Qtr.
- 65.210 Personal Health** 3 Cl.; 3 Q.H.  
 Principles of healthful living; their application to interpersonal relations and physical education.  
 Staff Fall and Winter Qtrs.
- 65.215 School and Community Health** (Prereq. 65.129) 3 Cl.; 3 Q.H.  
 Focus on the teacher's important role in developing and relating the principles, patterns, and programs of school and community health education.  
 Staff Summer Qtr.
- 65.216 Methods and Materials in Health Education** (Prereq. 65.215) 4 Cl.; 4 Q.H.  
 Materials appropriate to the teaching of health and safety in the elementary and secondary school; emphasis on direct unit instruction.  
 Staff Winter Qtr.
- 65.218 Public Health** 3 Cl.; 3 Q.H.  
 Principles of public health with particular emphasis on the emerging patterns of community organizations and activities in the public health field.  
 Staff Fall, Winter, and Summer Qtrs.
- 65.234 Health Problems of the School Child** 4 Cl.; 4 Q.H.  
 Recognizing common health problems of students, both physical and mental, so that they may be dealt with intelligently by the classroom teacher.  
 Staff Winter Qtr.

## Pharmacy and Allied Health Professions

- 71.201 Pharmacy Orientation** 1 Cl.; 1 Q.H.  
 The professional responsibilities of the pharmacist, his place as a member of the health professions, the interrelationships with the other health professionals, his education, the professional ethics, professional societies in pharmacy and other health professions, and professional opportunities.  
 Prof. Goldstein Winter Qtr.
- 71.202 Pharmacy Orientation** 1 Cl.; 1 Q.H.  
 Continuation of 71.201.  
 Prof. Goldstein
- 71.210 Pharmaceutical Calculations** (Prereq. 10.103 or equiv.) 2 Cl.; 2 Q.H.  
 The application of fundamental mathematical procedures and techniques to carry out small- and large-scale pharmaceutical calculations properly.  
 Staff Fall Qtr.
- 71.211 Pharmaceutical Methodology** (Prereq. 12.145) 3 Cl.; 3 Lab.; 4 Q.H.  
 Application of fundamental principles and methods to the formulation of

official and nonofficial preparations and dosage forms.

Prof. Palumbo

Fall Qtr.

**71.212 Pharmaceutical Preparations** (Prereq. 71.211) 3 Cl.; 3 Lab.; 4 Q.H.

A continuation of 71.211 with further reference to official and non-official preparations and more advanced dosage forms.

Prof. Smith

Winter Qtr.

**71.221 Physical Pharmacy** (Prereq. 71.212) 3 Cl.; 3 Lab.; 4 Q.H.

A theoretical discussion of chemical and physical principles that are of pharmaceutical importance; rheology, surface phenomena, colloidal systems, emulsification colligative properties, and solution kinetics.

Prof. Smith

Fall and Winter Qtrs.

**71.222 Pharmaceutical Technology** (Prereq. 71.221) 3 Cl.; 3 Lab.; 4 Q.H.

Application of the principles discussed in Physical Pharmacy 71.221 to specialized pharmaceutical formulations — such as sterile solutions, aerosols, dermatologicals, compressed tablets, and gels.

Prof. Pruyne

Spring and Summer Qtrs.

**71.232 Prescription Pharmacy** (Prereq. 71.222) 3 Cl.; 3 Lab.; 4 Q.H.

A correlation and integration of the previous instruction in the development of the pharmacist as a professional person. The compounding and dispensing of solid and semi-solid dosage forms of medication; the objectives of the course are to develop in the student: the ability to understand and interpret prescriptions, skill in compounding prescriptions, ability to evaluate and correct prescriptions from a pharmaceutical point of view, appreciation of the legal aspects of prescription practice, and an increased understanding of the use of drugs. Prescription clinic.

Prof. Palumbo

Winter Qtr.

**71.223 Prescription Pharmacy** (Prereq. 71.232) 3 Cl.; 3 Lab.; 4 Q.H.

Continuation of 71.232 including lecture-demonstration designed to provide the student with a practical knowledge of various surgical devices, appliances, bandages, and hospital and sickroom supplies used in modern patient care. The prescription clinic, with emphasis on prescription specialties, is continued.

Prof. Palumbo

Spring Qtr.

**71.238 Pharmacy Administration** 3 Cl.; 3 Q.H.

A comprehensive and applied approach to the operational aspects of retail pharmacy management. The case method of instruction will be used extensively as a supplement to lectures.

Prof. Goldstein

Spring Qtr.

**71.240 Introduction to Institutional Pharmacy** 3 Cl.; 3 Q.H.

A survey course design to acquaint the student with the operation of the modern hospital and nursing home from the point-of-view of the hospital pharmacist. The position of pharmacy services in relationship to overall operation of the hospital will be considered.

Prof. Goldstein

Spring Qtr.



- 71.241 Clinical Pharmacy** 3 Cl.; 3 Lab.; 4 Q.H.  
Introduces the student to the patient-oriented aspects of the practice of pharmacy. The laboratory portion of the course will consist of weekly hospital rounds with the medical staff. The didactic portion will consist of a discussion of the cases observed and the medications prescribed. Limited enrollment.  
Prof. Inashima and Palumbo Spring Qtr.
- 71.242 Special Research Project** (Prereq. Dean's permission) 3 Q.H.  
Research on special problems may be undertaken in one or more of the following areas: medicinal chemistry, pharmacognosy, pharmacology, pharmacy, and pharmacy administration.  
Staff Spring Qtr.
- 71.243 Pharmaceutical Jurisprudence** 4 Cl.; 4 Q.H.  
A comprehensive analysis and interpretation of all laws relating to the practice of pharmacy. Federal and State Food and Drug Laws, Narcotic Laws, Medicare and Medicaid regulations, and state pharmacy laws will be discussed.  
Prof. Goldstein Winter Qtr.
- 71.245 Pharmacy Administration I** 4 Cl.; 4 Q.H.  
Socio-economic aspects of pharmacy; the government's relationship to the pharmaceutical industry, trends in contemporary practice, third-party payment plans, macroeconomic impact on the industry, and the interaction of current concepts in pharmacy.  
Prof. Goldstein Spring and Summer Qtrs.
- 71.246 Pharmacy Administration II** 4 Cl.; 4 Q.H.  
General business principles as they relate to pharmacy management. Accounting procedures, financial statements analysis, managerial accounting, finance, and relevant aspects of business law will be discussed.  
Prof. Goldstein Fall Qtr.
- 71.247 Pharmacy Administration III** (Prereq. 71.246) 4 Cl.; 4 Q.H.  
A seminar course on the applied procedures for the management of an institutional pharmacy. Institutional pharmacy law, purchasing, budgeting, capital equipment, drug distribution systems, personnel management, inventory control, and formulary systems will be included.  
Prof. Goldstein Spring Qtr.
- 72.221 Medicinal Chemistry** (Prereq. 12.145, 73.241) 3 Cl.; 3 Q.H.  
A general consideration of factors instrumental in the penetration, localization, and interaction of drugs with biological receptors. Drugs acting on the central nervous system are discussed, including: anesthetics, hypnotics, sedatives, analgesics, anticonvulsants, tranquilizers and hallucinogens. Antineoplastic drugs and diuretics will also be considered. Structure-activity relationships will be stressed as well as the chemical mechanism by which



drugs react with receptor sites. Rational approaches to drug design and the development of new drugs will be emphasized.

Prof. Soloway

Spring and Summer Qtrs.

**72.222 Drug Analysis**

(Prereq. 12.171) 3 Cl.; 3 Lab.; 4 Q.H.

Principles of quantitative/analysis applied to natural or synthetic chemicals and drugs used in pharmacy and medicine; emphasis on the instrumental and chromatographic methods used in the official compendia.

Prof. Warner

Fall and Winter Qtrs.

**72.231 Medicinal Chemistry**

(Prereq. 72.221) 4 Cl.; 4 Q.H.

A comprehensive study of the chemistry, biochemistry, physical properties, and therapeutic use of the major drugs affecting the autonomic nervous system, and drugs affecting the cardiovascular system. The course correlates, where there is available information, the relationship of chemical structure, mechanism of action and the pharmacological effects in man of drugs in these categories.

Prof. Neumeyer

Fall Qtr.

**72.232 Medicinal Chemistry**

(Prereq. 72.231) 4 Cl.; 4 Q.H.

A continuation of the study of drugs and the approaches in drug design outlined in 72.231 especially as related to steroids and non-steroidal estrogens, antihistamines, the anti-infective agents, antiseptics, anti-malarial drugs, and anti-protozoal drugs.

Prof. Warner

Winter Qtr.

**73.200 Human Physiology**

(Prereq. 12.107, 18.132) 3 Cl.; 3 Lab.; 4 Q.H.

The first of a two-sequence course designed primarily for students of pharmacy as a basis for pharmacology and toxicology. Topics covered: the cell, body fluids and the urinary system; blood, immunity, and hypersensitivity; the cardiovascular system; the respiratory system.

Staff

Fall Qtr.

**73.201 Human Physiology**

(Prereq. 73.200) 3 Cl.; 3 Lab.; 4 Q.H.

Physiology of the nervous system and muscle; special sensory systems; gastrointestinal and metabolic systems; endocrinology and reproduction.

Staff

Spring and Summer Qtrs.

**73.221 Pharmacognosy**

(Prereq. 12.145) 3 Cl.; 3 Lab.; 4 Q.H.

The natural products of biological origin which are of pharmaceutical and medicinal significance; their gross characteristics and active constituents; macroscopic and microscopic identification—including selected physical and chemical methods; a biochemical approach based upon the general chemical groups of the major constituents.

Prof. Raffaui

Fall and Winter Qtrs.

**73.231 Pharmacology**

(Prereq. 73.201, 73.221, 73.241) 3 Cl.; 3 Lab.; 4 Q.H.

Basic principles and pharmacodynamics of medicinals; mechanisms of actions, posology, Toxicology, interactions, and rationale of their therapeutic

uses. Drugs are discussed according to their sites of action or major therapeutic use. Pharmacokinetics and fundamental nature of drug actions are studied in the laboratory.

Prof. Inashima

Fall Qtr.

### 73.232 Pharmacology

(Prereq. 73.231) 3 Cl.; 3 Lab.; 4 Q.H.

Continuation of 73.231.

Prof. Inashima

Winter Qtr.

### 73.237 Pharmacognosy

(Prereq. 73.221, 18.120) 3 Cl.; 3 Q.H.

A continuation of 73.221 with special emphasis upon products obtained from animals and micro-organisms to be used for immunological and antibiotic purposes. A discussion of allergenic plants and substances along with the different types of pesticides.

Prof. Raffauf

Winter Qtr.

### 73.241 Biochemistry

(Prereq. 12.145, 73.201 or concurrently) 4 Cl.; 3 Lab.; 5 Q.H.

Chemical nature of living matter with emphasis on the dynamic aspects related to normal biological phenomena. Qualitative and quantitative study of substances of biological importance with an introduction to biochemical basis of some clinical diagnostic tests.

Prof. Spector

Spring and Summer Qtrs.

### 73.242 Pharmacology

(Prereq. 73.232) 4 Cl.; 4 Q.H.

Continuation of 73.232 but without the laboratory.

Prof. Inashima

Spring Qtr.

### 73.245 Introduction to Pathology

(Prereq. 73.201, 73.241) 4 Cl.; 4 Q.H.

Basic concepts of pathology for the student of pharmacy with emphasis on disease processes and alterations of normal biochemical mechanisms.

Fall Qtr.

## Nursing

### 80.101 Fundamentals of Nursing

4 Cl.; 4 Lab.; 5 Q.H.

Basic to all other courses in nursing. Focus is on the patient as an individual. Underlying this is the concept of homeostasis and the role of the nurse in meeting basic needs. Nursing action is based upon the principles drawn from the behavioral social and biological sciences. Assignments in patient care are designed to provide the student with opportunities to interpret these principles in the promotion of health and the prevention of illness.

Prof. Wilcox and Staff

Fall Qtr.

### 80.102 Fundamentals of Nursing

(Prereq. 80.101) 4 Cl.; 4 Lab.; 5 Q.H.

The major focus is the identification of common deviations from homeostasis and the supportive nursing measures involved in the restoration of the patient to normal homeostasis.

Prof. Wilcox and Staff

Winter Qtr.

**80.103 Fundamentals of Nursing** (Prereq. 80.102) 4 Cl.; 4 Lab.; 5 Q.H.

The major focus is on the identification of specific long term deviations from homeostasis and the nursing actions involved in the restoration of the patient to optimal function and adaptation.

Prof. Wilcox and Staff

Spring Qtr.

**80.201 Nursing** 2 Cl.; 2 Lab.; 3 Q.H.

The first courses in nursing introduce the student to some of the social systems that influence the nurse and the individuals for whom care is provided in the nursing role. Emphasis is placed on those societal institutions which are concerned with health and improvement in the health care of individuals.

The course content demonstrates how concepts of nursing have developed and changed in relation to social changes and in relation to increasing knowledge and understanding of individuals as physiological, psychological, and social beings. Particular attention is given to the expanding scope of nursing as a major institution and to the present and projected goals of nursing as an integral part of the larger social system.

Laboratory experiences include group discussions and field trips to selected health agencies.

Miss Gagnon, Mrs. Barry

Fall Qtr.

**80.202 Nursing** (Prereq. 80.201) 2 Cl.; 2 Lab.; 3 Q.H.

Continuation of 80.201.

Miss Gagnon, Mrs. Barry

Winter Qtr.

**80.203 Nursing** (Prereq. 80.202) 2 Cl.; 2 Lab.; 3 Q.H.

Continuation of 80.202.

Miss Gagnon, Mrs. Barry

Spring Qtr.

**80.204 Nursing—Universal Needs**

(Prereq. 80.201, 80.202, 80.203) 4 Cl.; 3 Lab.; 5 Q.H.

Basic nursing theory and application in caring for people in hospital settings. Selected universal needs of man serve as the basis for the course and the focus is on the nursing process as it relates to meeting these needs.

Prof. Gates and Staff

Fall and Winter Qtrs.

**80.205 Nursing—Common Problems I** (Prereq. 80.204) 4 Cl.; 3 Lab.; 5 Q.H.

Focuses on exploring problems common to individuals who are unable to meet their own health needs. Clinical practice will introduce skills and activities to meet the needs of patients with these common problems in general hospital settings.

Prof. Gates and Staff

Spring and Summer Qtrs.

**80.206 Nursing—Common Problems II** (Prereq. 80.205) 5 Cl.; 9 Lab.; 8 Q.H.

Physiological and psychological disturbances in illness. Emphasis on the analysis of patient problems and the nurse's role in the control of infection; pharmacology and drug therapy, responses of body to stress, maintenance of nutrition, and patient teaching in long term illness. Clinical laboratory experience and a weekly discussion seminar group.

Prof. Goodfellow and Staff

Fall and Winter Qtrs.

- 81.101 Medical-Surgical Nursing** (Prereq. 80.103) 6 Cl.; 15 Lab.; 11 Q.H.  
Utilizing the concept that all illnesses produce alterations in body function, the student is introduced to selected conditions requiring medical and/or surgical intervention. Major emphasis in classroom and clinical instruction is upon the nurse's role in meeting patients' physical and psychosocial needs, further developing nursing techniques, and learning specific skills needed to care for assigned patients.

Prof. Bosanko and Staff

All Quarters

- 81.102 Medical-Surgical Nursing** (Prereq. 81.101) 3 Cl.; 9 Lab.; 6 Q.H.  
Sequential to 81.101. Designed to broaden the student's understanding of adults with more serious forms of physical illness. The content has been developed to present the nurse's responsibilities in caring for patients with alterations in physiologic functions and body image. Classroom and clinical experiences focus on principles and nursing skills that are involved in providing complex care for selected patients.

Profs. Carroll and DeScenza

Fall, Winter, and Spring Qtrs.

- 81.201 Medical-Surgical Nursing** (Prereq. 80.206) 4 Cl.; 15 Lab.; 9 Q.H.  
The physiological changes that underlie selected Medical-Surgical health problems. Guided clinical experiences are planned with special emphasis on the effects of illness on the individual's pattern of living, planning continuity of care, and health teaching. Classroom and clinical experiences focus on the knowledge and skills necessary to planning and implementing comprehensive health care.

Prof. Johns and Staff

All Quarters

**82.101 Maternal and Child Health**

(Prereq. 19.141, 19.142, 80.103) 6 Cl.; 18 Lab.; 12 Q.H.

Focuses on the family and the individual and their developmental task with emphasis on positive health practices within the family unit. The nursing approach centers upon the health needs of mothers and children of all ages. The needs of the hospitalized child are identified by studying the effect of illness upon his normal growth and development. The common illnesses of childhood are discussed.

Mrs. Otto and Staff

All Quarters

**82.201 Maternal and Child Health**

(Prereq. 80.206, 19.141) 4 Cl.; 15 Lab.; 9 Q.H.

Maternal and child nursing focuses on the nursing needs of mothers and children. This course considers various aspects and stresses encountered within the family structure, particularly as they relate to the expanding family and the child in health crisis. The course explores the present-day problems relating to maternal and child welfare and their implications for society.

Miss Lynch and Mrs. Marchessault

All Quarters

- 83.101 Psychiatric Nursing** (Prereq. 81.101, 82.101) 3 Cl.; 9 Lab.; 6 Q.H.  
Assists the student to acquire additional knowledge of human behavior; to provide the opportunity to achieve understanding of selected human moti-

ventions and defenses and to learn additional interpersonal skills which may be used in the nursing care of patients. The opportunity to apply this knowledge, to observe and analyze behavior and to practice the skills is offered in supervised laboratory sessions.

Prof. Gonyow and Staff

Fall, Winter, and Spring Qtrs.

### **83.201 Psychiatric Nursing** (Prereq. 80.206) 4 Cl.; 15 Lab.; 9 Q.H.

Designed to increase and develop knowledge of mental illness, understanding of the dynamics of human behavior, and the interrelationship of theory and practice as it applies to clinical and community aspects of mental health and psychiatric nursing.

Prof. Lee, Mrs. Puopolo, Mrs. Brown, Miss Sullivan

All Quarters

### **84.201 Public Health Nursing**

(Prereq. 81.201, 82.201, 83.201) 6 Cl.; 12 Lab.; 9 Q.H.

Increases understanding of the variety of ways communities organize to meet the health and welfare needs of their members. Principles of public health and public health nursing are examined in depth. Attention is given to current health and welfare legislation, environmental factors affecting health, and the role of the nurse in prevention of disease and maintenance of health. Laboratory experiences will provide opportunities to work with individuals, families, and community agencies.

Prof. Tingle, Miss Smith, Mrs. MacKenzie

Fall and Winter Qtrs.

### **85.201 Contemporary Nursing** (Prereq. 84.201) Cl. T.B.A.; Lab. T.B.A.; 9 Q.H.

The final nursing course before graduation. Includes lectures, seminars, progress reports and eight weeks of student selected placement experience. The core content includes legal aspects, roles, leadership, change and research methods. Students demonstrate self-direction by defining their objectives for placement experience, pursuing an area of nursing in which they are particularly interested, utilizing basic principles of research and evaluating their own performance.

Mrs. Barry and Staff

Spring Qtr.

## **Cooperative and Interdisciplinary Courses**

### **90.251 Placement Techniques**

1 Cl.; 1 Q.H.

Career selection and development are discussed concurrently with methods of achieving career goals. Techniques of resumé preparation, personal presentation, and effective written communication are treated to facilitate the planning and implementation of a professional career program.

Staff

Fall and Winter Qtrs.

### **90.253 Professional Development for Teachers**

1 Cl.; 1 Q.H.

Teaching as a profession is discussed concurrently with methods of achieving career goals by developing the techniques of resumé preparation, effective oral and written communication, and the interviewing process. Topics

affecting professional growth, such as teacher certification, professional ethics, and professional development, will be examined. College of Education faculty will discuss the various aspects of professionalism.

Staff

Fall and Winter Qtrs.

#### **90.254 Professional Development for Nurses**

1 Cl.; 1 Q.H.

Nursing as a profession is discussed concurrently with methods of assisting the senior to assume her role as a graduate nurse. Topics relative to personal, legal, and professional responsibilities are examined as well as techniques of resumé preparation, effective oral and written communication and personal presentation.

Staff

Fall and Winter Qtrs.

#### **90.257 Professional Development for Engineers**

1 Cl.; 0 Q.H.

Career development in the respective engineering fields is examined with a view to current practice and demands, and developing trends of the profession. Effective techniques of resume preparation, oral and written communication, and personal presentation are discussed to facilitate the planning and implementation of a professional career program.

Staff

Fall and Winter Qtrs.

#### **93.110 Programming Computers with Fortran**

(Prereq. one year college math.) 4 Cl.; 4 Q.H.

Techniques for programming problems on any large computer. The course includes problem analysis; transformation of solution methods into flowcharts; the FORTRAN language; restrictions and their circumvention; principles of programming and program testing; and production runs. No prior experience is required. Students will solve problems using the large University computer.

Dr. Eisemann

Winter and Spring Qtrs.

## **Military Science**

### *Military Science I*

#### **91.101 U.S. Defense Establishment**

3 Cl.; 1 Q.H.

Emphasis is given to the history, organization, and mission of the Department of Defense. Further, the mission and organization of the U.S. Army with emphasis given to the integration of small units into larger units and the general design of military organization is taught.

Fall Qtr.

#### **91.102 American Military History**

(Prereq. 91.101) 3 Cl.; 1 Q.H.

Selected battles and campaigns, coupled with major periods of international crises, are studied with a view towards giving the student an appreciation of the development of the U.S. Army.

Winter Qtr.

**91.103 Leadership Laboratory**

(Prereq. 91.102) 1 Cl.; 2 Lab.; 1 Q.H.

Progressive training in leadership, drill, and command. Exercise in command is stressed wherein students perform duties and functions as officers incident to conduct of training.

Spring Qtr.

*Military Science II***91.104 Map and Aerial Photo Reading — Introduction to Tactics**

(Prereq. 91.103) 3 Cl.; 1 Q.H.

Use of maps and aerial photographs in order to develop an understanding and an appreciation of these instruments of command. The principles and fundamentals of small units tactics are emphasized in order to develop an understanding of the duties, responsibilities, and methods of employing basic military units.

Fall and Winter Qtrs.

**91.105 Fundamentals and Dynamics of the Military Team — Leadership Laboratory**

(Prereq. 91.104) 1 Cl.; 2 Lab.; 1 Q.H.

Employment of the rifle platoons and rifle company with emphasis on the responsibility of command, span of control, planning, coordination, and decision-making. Leadership Laboratory as described in 91.103.

Spring and Summer Qtrs.

*Military Science III***91.106 Fundamentals and Dynamics of the Military Team I**

(Prereq. 91.105) 3 Cl.; 2.5 Q.H.

The role of the Branches of the Army, to include history, development, mission, organization, and employment within the overall mission of the Army. (Continued emphasis on tactics and operations as described in 91.104.)

Fall and Winter Qtrs.

**91.107 Leadership and Management I — Leadership Laboratory**

(Prereq. 91.106) 1 Cl.; 2 Lab.; 2.5 Q.H.

Discussion of the basic problems in small unit leadership with emphasis on group dynamics and functional role of a platoon leader in setting platoon goals and standards, motivating performance, use and support of the non-commissioned officer. Leadership Laboratory as described in 91.103.

Spring and Summer Qtrs.

**91.108 Leadership and Management I**

(Prereq. 91.107) 3 Cl.; 2.5 Q.H.

Principles to be followed in presenting effective military instruction. Staff organization and responsibilities; troop leading procedures; decision making; composition and development of military intelligence; combined arms operations from patrol to company level.

Fall and Winter Qtrs.

*Military Science IV***91.109 Fundamentals and Dynamics of Military Team I —****Leadership Laboratory**

(Prereq. 91.108) 1 Cl.; 2 Lab.; 2.5 Q.H.

Composition and mission of combined arms forces, company size through



battalion size, in offensive, defensive, and special operations. Leadership Laboratory as described in 91.103.

Spring and Summer Qtrs.

**91.110 Leadership and Management II** (Prereq. 91.109) 3 Cl.; 2.5 Q.H.

The organizational, environmental, personnel, and operational problems encountered by the manager of the modern military team. Included is an analysis of the strategic factors of power as an environmental background in which the military team is employed.

Fall and Winter Qtrs.

**91.111 Leadership and Management II — Leadership Laboratory**

(Prereq. 91.110) 1 Cl.; 2 Lab.; 2.5 Q.H.

An orientation to what is expected of the cadet while attending summer camp. Provides for physical training to ensure that the cadet is physically prepared. Leadership Laboratory as described in 91.103.

Spring Qtr.

## Criminal Justice

**92.106 Introduction to Law Enforcement**

4 Cl.; 4 Q.H.

Basic considerations of organization and administrative and operational services, with special emphasis upon the role of the police in contemporary society, examining recruitment, retention, attrition, socialization, self-evaluation, and attitudinal and behavioral changes of career officers.

Prof. Natoli

Fall and Winter Qtrs.

**92.110 Police-Community Relations**

4 Cl.; 4 Q.H.

Police-public contact; uses of the communications media in projecting the police image; responsibilities of police in dealing effectively with minority groups, civil rights, civil disorder, and public protection. An exploration of the role and function of the police in intergroup relations.

Prof. Sheehan

Fall and Winter Qtrs.

**92.112 Criminal Behavior**

4 Cl.; 4 Q.H.

An analysis of various non-conformist and criminal activities generating contemporary sub-cultures, societal norms, and legal precepts — including the police, the courts, and the correctional systems—are explored as they relate to deviant subcultures.

Prof. Natoli

Fall and Winter Qtrs.

**92.113 Law Enforcement Procedures and Social Structure**

4 Cl.; 4 Q.H.

Law enforcement systems in relation to class structure, political, economic, and social power, police and community subcultural developments, and problems of professionalization.

Prof. Natoli

Spring and Summer Qtrs.

**92.115 Police Operations**

4 Cl.; 4 Q.H.

A general survey of police operational procedures including patrol, traffic,



interrogations, and report writing. Role-playing is used extensively to demonstrate interviewing methods.

Prof. Sheehan

Spring and Summer Qtrs.

**92.131 Law Enforcement Administration and Management** 4 Cl.; 4 Q.H.

The principles of police organization, administration, and management; including staff and line functions, chain of command, span of control, selection of personnel and promotional systems. Consideration is also given to special problems such as strikes, natural and atomic disasters, narcotic traffic, and vice control.

Prof. Sheehan

Fall and Winter Qtrs.

**92.132 Police Supervision**

The police supervisor's role in discipline; intradepartmental relations, problem-handling and personnel policies. Problems relating to supervisory relationships, wages, grievances, morale, and safety.

Prof. Natoli

Spring and Summer Qtrs.

**92.133 Criminal Investigation and Case Preparation** 4 Cl.; 4 Q.H.

Crime scene procedure; collection and preservation of evidence; recording the crime scene; surveillance; identification; investigative techniques; and methods of preparing a case for court.

Prof. Cunliffe

All Quarters

**92.134 Civil Liberties: Substantive Rights** 4 Cl.; 4 Q.H.

Utilizing Supreme Court decisions and other sources, this course will encompass a study of the constitutional rights of speech, press, religion, association, equal protection of the laws, and their relevance to a democratic society.

Prof. Kassler

Spring and Summer Qtrs.

**92.141 Criminal Law: Procedural Due Process** 4 Cl.; 4 Q.H.

Utilizing current Supreme Court decisions and other sources, this course will examine the relationship between the Bill of Rights and the States, with primary emphasis on the guarantees of fair trial, counsel, privacy, immunity from self-incrimination, and other constitutional safeguards in state and Federal criminal proceedings.

Prof. Kassler

Fall and Winter Qtrs.

**92.142 Evidence and Court Procedure** 4 Cl.; 4 Q.H.

Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof; competency; consideration of witnesses. Fundamentals of court room procedure; testifying in court; the principles of prosecuting a case; the introduction of evidence. Role-playing is used as a learning device in mock trials. Class members are required to attend and report on criminal trials.

Prof. Kassler

Spring and Summer Qtrs.

- 92.143 Introduction to Criminalistics** 2 Cl.; 4 Lab.; 4 Q.H.  
 A survey of the elements of microscopy, spectroscopy, and basic chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons, and other materials which comprise physical evidence.  
 Prof. Cunliffe All Quarters
- 92.146 Legal Aspects of Society** 4 Cl.; 4 Q.H.  
 Twentieth-century society with an emphasis upon the legal structure and its impact upon society.  
 Prof. Kassler Fall and Winter Qtrs.
- 92.155 Seminar in Law Enforcement** 4 Cl.; 4 Q.H.  
 An opportunity for free discussion about the numerous problems facing the law enforcement officer. Periodic oral and written reports are required. Guest lecturers are invited to participate in and lead discussion sessions. An effort is made to have each student formulate his own philosophy of law enforcement prior to his graduation.  
 Prof. Sheehan Spring and Summer Qtrs.
- 92.160 Social Welfare Problems in Criminal Justice** 4 Cl.; 4 Q.H.  
 A critical examination of Culture-of-Poverty themes; a brief study of the Social Welfare system; development of techniques for referral to social agencies; development of self-awareness through thoughtful evaluation of personal bias and experience.  
 Prof. Ames Fall and Winter Qtrs.
- 92.161 Delinquency and Adolescent Behavior** 4 Cl.; 4 Q.H.  
 Psychodynamic development of the adolescent personality and growth of delinquency patterns in this culture. Current novels and essays as well as standard texts will be used.  
 Prof. Ames Spring and Summer Qtrs.
- 92.162 Introductory Statistics and Social Research** 4 Cl.; 4 Q.H.  
 An elementary survey and analysis of the uses of statistics and social research methods, with special reference to utilization of data from the field of criminal justice. The first part of the course covers descriptive statistics and the second examines the basic techniques in social research. Attention is given to methods of collecting, analyzing, and interpreting statistical data, and to the use of statistics in the development of research designs.  
 Prof. Senna Fall and Winter Qtrs.
- 92.163 Crime and Correction** 4 Cl.; 4 Q.H.  
 Considers the historical background of criminology, theories of criminal behavior, as well as types of offenses and offenders. Basic principles of criminology will be examined. The nature and extent of crime and its effects upon society will be studied together with the major approaches to its prevention, control, and treatment.  
 Prof. Senna Fall and Winter Qtrs.

**92.164 Introduction to Corrections**

4 Cl.; 4 Q.H.

The total correctional process from probation through institutions, to parole. It is intended to provide the student with a broad understanding of corrections as a field of study. It provides a total review and orientation of current correctional concepts. The relationship of corrections to other behavioral sciences and the reliance of contemporary corrections on social welfare is demonstrated.

Prof. Senna

Spring and Summer Qtrs.

**92.165 Rehabilitation of the Offender**

4 Cl.; 4 Q.H.

This course will present the basic concepts for influencing and changing human behavior. Special attention will be given to an examination of various types of current programs and services developed in the criminal justice system to rehabilitate the offender. Particular emphasis will be given to contemporary practices in corrections, such as the community-based work release program, half-way houses, and various forms of individual treatment services.

Prof. Senna

Spring and Summer Qtrs.

**92.191 Directed Study**

4 Q.H.

**92.192 Directed Study**

4 Q.H.

**92.193 Directed Study**

4 Q.H.

**92.201 History of Criminal Justice**

3 Cl.; 3 Q.H.

An historic survey of the principles of Criminal Justice in the ancient and medieval periods with emphasis upon the impact of religion and philosophy.  
Dean Rosenblatt

Fall Qtr.

**92.202 History of Criminal Justice**

3 Cl.; 3 Q.H.

A continuation of the historic survey with an examination of the effect of the Renaissance Reformation and the rise of nation states.

Dean Rosenblatt

Winter Qtr.

**92.203 History of Criminal Justice**

3 Cl.; 3 Q.H.

Criminal Justice in the Modern and Contemporary periods from the Eighteenth Century to the present.

Dean Rosenblatt

Spring Qtr.

# other administrative officers and staff

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Director of Student Housing

**Michael Allen**  
Programmer  
Administrative Computer Services

**Salvatore A. Amico, A.S.**  
Assistant Bursar

**Ada Ruth Anderson**  
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Admissions

**Ralph Anthony**  
Floor Manager,  
Bookstore

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**Ralou Athas**  
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---

## GIFTS AND BEQUESTS

Northeastern University will welcome gifts and bequests for the following purposes:

- (a) For its building program.
- (b) For general endowment.
- (c) For specific purposes which may especially appeal to the donor.

It is suggested that, when possible, those contemplating gifts or bequests confer with the President of the University regarding the University's needs before legal papers are drawn.

The legal name of the University is "Northeastern University." However, in the making of gifts and bequests to Northeastern the following wording is suggested: "Northeastern University, an educational institution incorporated under the laws of Massachusetts and located in Boston, Massachusetts."

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northeastern university



lincoln college 1971-1972



# northeastern university LINCOLN COLLEGE 1971-1972

Programs in:  
aviation technology  
allied-medical technology  
engineering technology  
industrial technology  
science technology



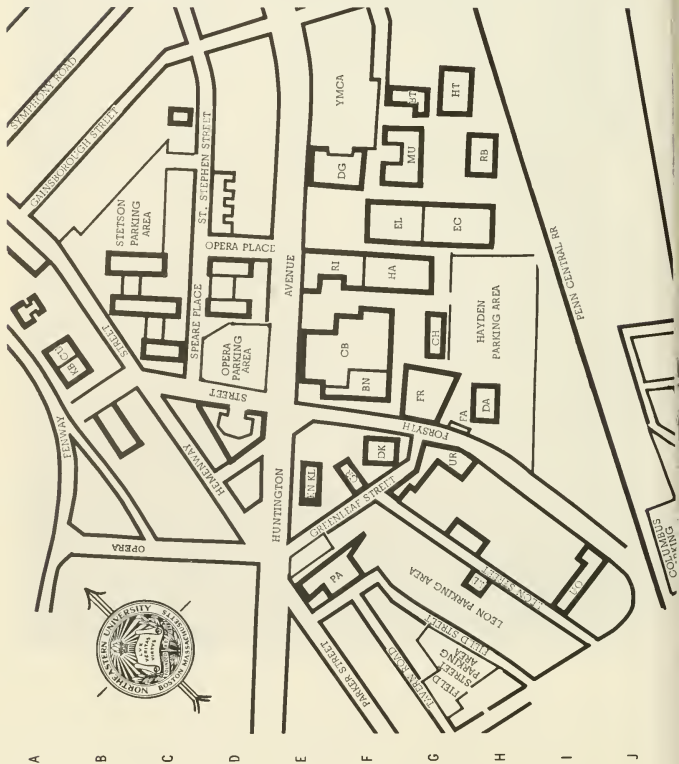
Northeastern University  
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Boston, Massachusetts 02115



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MAP  
REFERENCE

Building  
Designation

F6	Barletta Natatorium	BN
F10	Botolph Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Church Hill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	ELL Student Center and Alumni Auditorium	EC
F8	Forsyth Building	EL
G6	Forsyth Building Annex	FR
G5	Forsyth Dental Building	FA
B5	Greenleaf Building	GR
F4	Hayden Hall	HA
F7	Hurtig Hall (Chemistry)	HT
G10	Kennedy Building	KB
B6	Knowles Center (Crim. Justice)	KN
E4	Knowles Center (Law)	KL
E4	11 Leon Street	LE
J3	40 Leon Street	LU
H3	Mugar Life Sciences Building	MU
F9	Parker Building	PA
F3	Richards Hall	RI
E7	Robinson Hall	RB
H9	United Realty Building	UR
G5		



### **Office Hours at Huntington Avenue Campus, Boston**

*June 21, 1971 — September 10, 1971*

Monday-Thursday ..... 8:30 A.M.-8:30 P.M.  
Friday ..... 8:30 A.M.-4:30 P.M.

*September 13, 1971 — June 17, 1972*

Monday-Friday ..... 8:30 A.M.-8:30 P.M.  
Saturdays ..... 9:30 A.M.-12:00 Noon

### **Office Hours at Suburban Campus, Burlington**

Special representatives from the Huntington Avenue Campus will be in attendance during specified dates at registration periods for guidance and counseling. Regular office hours at the campus in Burlington are 8:30 a.m.-10:00 p.m., Monday-Friday, and 8:00 a.m.-1:00 p.m., Saturday. Telephone 272-5500.

### **Program Counseling at Extensions**

Program counsellors are available on a regular schedule at Lincoln College and extensions at: the Wyman Junior High School, Burlington; the North High School, Framingham; the North High School and East Junior High School, Weymouth; the English High School, Lynn; and the Norwood Airport, Norwood. Appointments may be arranged by telephoning the Lincoln College office at 437-2500.

### **Interviews**

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to arrange for personal interviews. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success.

#### **Address communications to:**

William F. King, Director  
Lincoln College  
Northeastern University  
360 Huntington Avenue  
Boston, Massachusetts 02115  
Telephone 437-2500

## 1971-1972 ACADEMIC CALENDAR

### FALL QUARTER 1971

*Classes begin September 27*

#### Fall Registration

Boston	5:30-8:30 p.m.	September 7
	12 noon 8:30 p.m.	September 9
	5:30-8:30 p.m.	September 13 and 14
	5:30-8:30 p.m.	September 15, 16 and 17
	9 a.m.-12 noon	September 18
	5:30-8:30 p.m.	September 20-24
Burlington	12 noon 8:30 p.m.	September 8
	5:30-8:30 p.m.	September 14 and 20
Lynn English High	5:30-8:30 p.m.	September 14 and 20
Weymouth East Jr. High School	5:30-8:30 p.m.	September 14 and 20
Framingham North High School	5:30-8:30 p.m.	September 14 and 20
Classes begin		September 27
Columbus Day Observed	No Classes	October 11
Veterans' Day Observed	No Classes	October 25
Thanksgiving Recess	No Classes	November 25-27
Final Examination Period For Fall Quarter		December 14-20

### WINTER QUARTER 1971-1972

*Classes begin January 3, 1972*

#### Winter Registration

Boston	5:30-8:30 p.m.	December 13-17
Burlington	5:30-8:30 p.m.	December 14
Lynn English High	5:30-8:30 p.m.	December 13
Weymouth	5:30-8:30 p.m.	December 16
Framingham	5:30-8:30 p.m.	December 15
Christmas Vacation		December 21-January 2
Classes Begin		January 3
Washington's Birthday Observed	No Classes	February 21
Final Examination Period For Winter Quarter		March 20-25

### SPRING QUARTER 1972

*Classes begin April 3*

#### Spring Registration

Boston	5:30-8:30 p.m.	March 20-24
Burlington	5:30-8:30 p.m.	March 21
Lynn English High	5:30-8:30 p.m.	March 20

Weymouth	5:30-8:30 p.m.	March 23
Framingham	5:30-8:30 p.m.	March 22
Spring Recess (or make-up period for lost snow days)		March 27-April 1
Spring Quarter Begins		April 3
Patriot's Day Observed	No Classes	April 17
Memorial Day Observed	No Classes	May 29
Final Examination Period		
For Spring Quarter		June 19-24
Commencement		June 18

## SUMMER QUARTER 1972

*Classes begin June 26*

### Registration for Entire Summer Quarter

Boston	5:30-8:30 p.m.	June 19-23
Burlington	12 noon-8:00 p.m.	June 20
Independence Day Observed	No Classes	July 4
Labor Day Observed	No Classes	September 4
Final Examination Period		
For Summer Quarter		September 11-15

# the governing boards and officers of the university

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# the university

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men and women.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), and the College of Criminal Justice (1967). This educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

## UNDERGRADUATE COLLEGES

### **Boston-Bouvé College**

Boston-Bouvé College offers three major programs of study: physical education and recreation education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### **The College of Business Administration**

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

### **College of Criminal Justice**

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Arts in Criminal Justice.

### **The College of Education**

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

### **The College of Engineering**

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial, and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours part-time programs leading to the Bachelor of Science degrees in Electrical Engineering and Civil Engineering. These programs extend over eight years, cover the identical courses given in the day cooperative curriculum, and meet the same qualitative and quantitative standards of scholarship.

### **The College of Liberal Arts**

The College of Liberal Arts offers majors in the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

### **Lincoln College**

Lincoln College offers engineering technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also conducts science technology, allied-medical technology, computer engineering technology, and aviation technology programs leading to the Associate in Science or Bachelor of Science degrees.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

### **The College of Nursing**

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

### **The College of Pharmacy and Allied Health Professions**

The College of Pharmacy and Allied Health Professions offers a five-year cooperative curricula leading to the degrees of Bachelor of Science in Pharmacy, Medical Records Science, and Medical Technology; and the degrees of Associate in Science in Dental Hygiene, Radiologic Technology, and Respiratory Therapy.

### **University College**

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement, Education, and Health-Related Programs, leading to the Associate in Science and Bachelor of Science degrees. It does not duplicate the offerings of the day college, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of forty quarter hours of credit. Courses are offered in Boston as well as at Burlington, Framingham, Lynn, Weymouth, and several other convenient locations.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

In collaboration with Lincoln College, University College offers programs in Allied-Medical Technology and Science Technology leading to the Bachelor of Science degree. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## **GRADUATE SCHOOLS**

### **Actuarial Science**

Master of Science in Actuarial Science.

**Arts and Sciences**

Master of Arts, Master of Science, Master of Science in Health Sciences, Master of Public Administration, Doctor of Philosophy.

**Boston-Bouvé College**

Master of Science in Physical Education and Master of Science in Recreation Education.

**Business Administration**

Master of Business Administration.

**Education**

Master of Education, and the Certificate of Advanced Graduate Study.

**Engineering**

Master of Science with course specification, including a special six-year program in power systems engineering leading to both bachelor's and master's degrees in electrical engineering; a similar six-year program in mechanical engineering leading to both bachelor's and master's degrees; Engineer degree; and Doctor of Philosophy degree in the fields of electrical, chemical, and mechanical engineering.

**Law**

Juris Doctor.

**Pharmaceutical Sciences**

Master of Science with specialization in hospital pharmacy, industrial pharmacy, medicinal chemistry, and pharmacology.

**Professional Accounting**

Master of Science in Accounting.

**Professional Accounting**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. The graduate schools are under the jurisdiction of the basic college deans.

**CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.



Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## **OFFICE OF EDUCATIONAL RESOURCES**

"The Office of Educational Resources exists to provide (1) facilities and services that enhance student learning, (2) instructional services and equipment that assist faculty in providing efficient and effective instruction, and (3) research and development directed toward the ultimate implementation of empirically tested instructional systems and innovations. The Instructional Systems Analysis Group, a Special Projects Group, and three divisions—Programmed Learning, Instructional Media, Instructional Communications—carry out the objectives. Of particular student interest is the Center for Programmed Study located in 211 Dodge. There, students study courses taught via self-instructional programs, use programs to supplement course work, fulfill course prerequisite requirements, pursue remedial or review knowledge, or study just for fun. Each student's activity and progress is constantly monitored; faculty assist when content problems arise. Also of note is the Instructional Materials Information Center which provides a central facility and clearinghouse concerning state-of-the-art information on educational technology and innovations; and houses instructional materials from preschool through graduate levels such as texts, programs, activity boxes, slides, filmstrips, illustrations, motion pictures, laboratory kits, simulations, models, video and audio tapes, teacher's manuals, curriculum guides, research reports, standardized tests and other instructional support materials."

## **DAY PROGRAMS FOR ADULTS**

These programs were developed to meet the needs of adults who wish to engage in part-time study during the day only. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

## **AFFILIATED PROGRAMS**

### **For Dental Hygienists**

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

### **For Commercial Pilots**

Lincoln College in collaboration with Wiggins Airways, Inc. conducts full-time day and part-time evening programs in Commercial Aviation Technology in which the student earns the Associate in Science degree



and may become licensed by the Federal Aviation Administration with commercial, instrument, and instructors pilot ratings.

#### **For Medical Technologists**

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

The Lincoln College also offers a part-time evening program leading to the Bachelor of Science degree.

#### **For Nurses**

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

#### **For Radiologic Technologists**

Lincoln College in collaboration with over 50 A.M.A. accredited Hospital Schools of Radiologic Technology located in the New England area conducts a program leading to certification as a registered Radiologic Technologist (R.T.) and the Associate in Science degree.

#### **For Inhalation Therapists**

This program is conducted by the Division of Health Sciences.

### **RESEARCH ACTIVITIES**

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# buildings and facilities

## **Location of Main Campus**

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intra-state lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

## **Carl S. Eli Student Center**

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

## **The University Library**

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 280,000, and microfilm titles, 300,000. Collections are located in these areas:

1. The general collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.

2. The reference collection in the Cabot Reading Room to the left of the circulation desk, which includes bibliographies, maps, company publications, the pamphlet file, and association publications. Theses, under the supervision of the Reference Dept., housed in the basement and should be requested in the Reference Room.
3. The periodical collection on the basement level, housed in the Periodical Room, consisting of current periodicals, periodical indexes and abstracts, with 2 stack levels adjacent for back files of bound volumes.
4. The reserve book collection on the second floor.
5. The foreign literature collections in the Webster Reading Room to the right of the circulation desk. Trade bibliographies also located here.
6. The collections of fine arts, philosophy, psychology, religion, and education housed in the Richardson Room on the second floor. The audio facility for spoken and music recordings and magnetic tapes for instructional and individual use also located in this room.
7. The American and English literature collections in the Literature Reading Room.
8. Government documents maintained on the basement level adjacent to the Periodical Room, along with the microtext collection. This collection includes 300,000 titles in microprint, microfilm, and microfiche forms.

There are also book catalogs of the collections in the library at Norwood Airport, Math/Psych Library, Chemistry Library, and in both the Documents and Reserve Book Rooms. There is an information desk in the Reserve Book Room to assist people in using the card catalog during the day.

The circulation dept. has a printed list of all materials charged out, which may be consulted by all users. To borrow materials, university identification must be presented. For extensive research, where the University Library does not have the material, application should be made to the Inter-Library Loan Librarian for materials needed from other libraries. Information service is available in this dept. in the evenings.

#### **Library Hours — Boston Campus**

Monday — Thursday 7:45 a.m. to 10:00 p.m.

Friday 7:45 a.m. to 7:30 p.m.

Saturday 8:30 a.m. to 4:00 p.m.

Sunday & Holidays 1:00 p.m. to 10:00 p.m.

The Reference Room and the reading rooms on the second floor are open until midnight, Monday-Thursday and until 10:00 p.m. on Friday.

The University Library System includes three graduate libraries in the Division of Research. Physics-electrical engineering is housed in 325 Dana Research Center. Mathematics-psychology is housed on the fifth floor of the United Realty Building and chemistry is located on the first floor of the Chemistry Building.

**Library Hours — Suburban Campus, Burlington**

Monday — Friday	8:30 a.m. to 9:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m.

**Suburban Campus**

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

**Henderson House**

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

**Warren Center**

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

**Marine Science Institute**

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instruction facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.



# lincoln college administration

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*Assistant to the Director and  
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President, Adult Student Council

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Hollis S. Baird  
William F. King

Frank E. Truesdale

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(Chemistry)

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(Production Drawing and Design)

William O. Bruehl, B.S.

(Materials)

Ralph A. Buonopane

(Chemistry)

Leroy M. Cahoon, B.S. in C.E., M.S.,

P.E. (Mass)

(Civil Engineering Technology)

Bruce B. Claflin, A.B., M.S.

(Calculus)

Laurence F. Cleveland, B.S., M.S.,

P.E. (Mass)

(Electrical Engineering

Technology)

Edward M. Cook, A.B., A.M.

(Mathematics)

Warren C. Dean, A.B., M.A.

(Differential Equations)

William D. Finan, A.B., M.A.

(Introductory Mathematics)

John L. Freedman, B.S., P.E. (Mass)

(Electronics)

Arthur F. Gustus, B.S., Ed.M.

(Physics)

Francis R. Hankard, B.S., M.A.

(Physics)

Charles E. Hamilton

(Flight School)

George C. Harrison

(Pulse Circuits & Elect. Labs.)

Malcolm D. Kruger, B.S.

(Electrical and Electronic

Graphics)

Britta Karlsson, B.S., M.S., M.T.

(A.S.C.P.) (Medical Technology)

Robert S. Lang, B.S., Ed.M.

(Graphics and Computation)

Demetre P. Ligor, B.S.E.E., P.E.

(Mass) (Particles and Waves)

Walter Messcher, B.M.E., M.S.

(Computer Programming)

Carl Miller, A.B., LL.B., Ed.M.

(Introductory Mathematics)

Ernest E. Mills, B.S., M.S., P.E.

(Mass) (Mechanical Engineering

Technology)

Bernard C. Reddy, B.S., Ed.M.

(Introductory Physics)

Fred A. Rosenberg, A.B., Ph.D.

(Biology)

Ralph W. Sexton, B.S., M.S., P.E.

(Mass) (Mechanical Engineering

Laboratory)

Harold M. Sharaf, B.S., M.S.

(Communications Engineering)

Matthew Stevens, B.S.

(Radiologic Technology)

Thomas H. Wallace, B.S., M.A., Ph.D.

(Physics)

Willard B. Whittemore, B.S., in C.E.,

Ed.M., C.A.G.S.

(Algebra and Trigonometry)

Albert G. Wilson, Jr., B.S. in C.E.,

M.S., P.E. (Mass), S.E. (Illinois)

(Mechanics and Dynamics)

### Office Staff

Rasma Galins, Administrative Secretary

Maryellen Cummings, Secretary of Operations

Dianne C. Rogers, Secretary of Records

Mary L. Tangney, Secretary

Doris S. Totoro, Secretary

Laurie Ritzlin, Receptionist

# the role and scope of lincoln college

## **Purpose**

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied-science or technological nature. Its purpose is to assist professional personnel, qualified to deal with the applications and uses of the biological, natural, and physical sciences, in better meeting community needs. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction prepare the graduate for activities allied to the fields of engineering, science or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, though they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are based upon principles of science, and include post-secondary-school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
5. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
6. Graduates from the associate degree programs have opportunities for educational work leading to the Bachelor of Engineering Technology and Bachelor of Science degrees.

## **Technology and the Technologist**

Scientific and technological skills range over a very broad spectrum extending all the way from extremely simple craftsmanlike activity



to highly complex and abstract activity. At one end of the spectrum is the professional whose work is mostly theoretical in character. He studies, reasons, and visualizes how new knowledge may be used in the development of solutions to technical problems. Usually he is not completely knowledgeable of the detailed procedures used by the skilled craftsman who executes the ideas, procedures, and designs.

The technologist is the pivot-man on the professional-technologist-craftsman team. He works with the professional engineer, scientist, doctor, supervisor, and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures, and techniques. His responsibilities are technologically important — professional opportunities are limited only by ambition, ability, and education.

When employed in research, design, or development, the technologist usually acts as direct supporting personnel to the professionals. If he functions in a capacity related to production, operation, testing or control, he usually follows a course prescribed by a professional but may not work closely under his direction. If installation, maintenance, or sales are his areas of responsibility, he is frequently performing a task that would otherwise have to be performed by the professional. He thereby assumes the more routine professional functions demanded by our increasingly scientific and technical society.

In executing his functions the technologist is required to use a high degree of rational thinking, to employ post-secondary school mathematics and the principles of the biological, natural, and physical sciences. The skilled technologist works with his mind as well as his hands. He considers why things work as well as how things work. To perform his functions efficiently, the technologist must effectively communicate technical and scientific information mathematically, graphically, and linguistically.

### **The Need for Technologists**

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural, and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double — a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower most efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing at a faster rate than for any other occupational group — a 50 per cent increase is expected in the next five years. More than 200,000 technologists will be needed each year, whereas schools now graduate only 50,000 per year. The tech-

nologist's employment opportunities are varied and much demanded in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state, and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics, and metal industries, as well as transportation and communication industries.

## PROGRAMS OF INSTRUCTION

Recognizing the growing need for technicians and technologists and their expanding role in modern society, Lincoln College offers Pre-Technology Preparatory Courses and degree programs leading to the Associate in Engineering (A.E.); Associate in Science (A.S.); Bachelor of Engineering Technology (B.E.T.); and Bachelor of Science (B.S.) degrees as follows:

### Pre-Technology

Introductory Mathematics, Basic Mathematics, Physics, and Chemistry .....	page 55
Reading-Improvement Program (non-credit) .....	page 56
Programmed Instruction Review Courses (non-credit) .....	page 56

### Allied-Medical Technology

Bioelectronic Engineering Technology (A.E. degree) .....	page 58
Radiologic Technology (A.S. degree) .....	pages 59-60
Cytotechnology (B.S. degree) .....	pages 61-62
Medical Technology (B.S. degree) .....	pages 63-64

### Aviation Technology

Commercial Aviation Technology (A.S. degree)	
— 4 years evenings .....	page 67
Commercial Aviation Technology (A.S. degree)	
— 2 years days .....	page 68

### Science Technology

Chemical-Biological Technology (A.S. degree) .....	page 70
Chemical-Physical Technology (A.S. degree) .....	page 71
Mathematical-Physical Technology (A.S. degree) .....	page 72
Chemical-Biological Technology (B.S. degree) .....	pages 73-74

### Civil Engineering Technology

Environmental Engineering (A.E. degree) .....	page 76
Structural Engineering Technology (A.E. degree) .....	page 77
Surveying and Transportation Engineering Technology (A.E. degree) .....	page 78
Civil Engineering Technology (B.E.T. degree) .....	pages 79-80
Mechanical-Structural Engineering Technology (B.E.T. degree) .....	pages 81-82

### **Electrical Engineering Technology**

Bioelectronic Engineering Technology (A.E. degree) .....	page 58
Electrical Power Engineering Technology (A.E. degree) .....	page 84
Electronics Engineering Technology (A.E. degree) .....	page 85
Control Systems Engineering Technology (Certificate) .....	page 88
Electrical Engineering Technology (B.E.T. degree) .....	pages 86-87

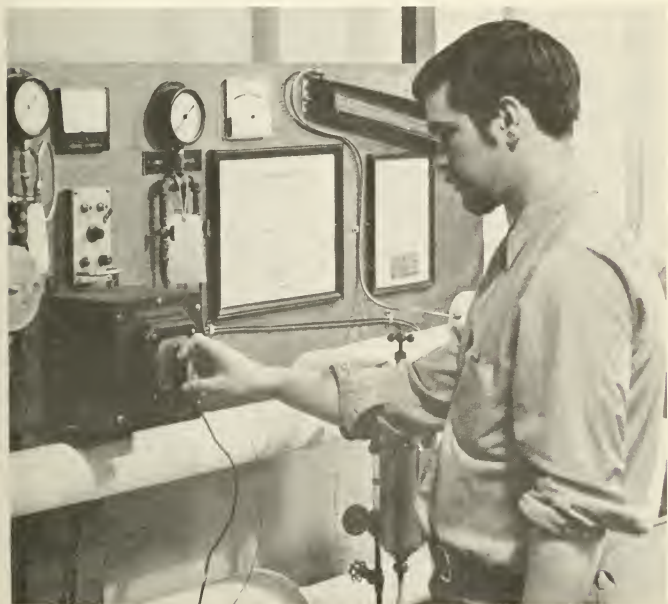
### **Mechanical Engineering Technology**

Mechanical Engineering Technology (A.E. degree) .....	page 90
Heat Engineering Technology (A.E. degree) .....	page 91
Mechanical Engineering Technology (B.E.T. degree) .....	pages 92-93
Mechanical-Structural Engineering Technology (B.E.T. degree) .....	pages 81-82

Computer Engineering Technology (A.E. degree) .....	page 94
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### **Day Cooperative Bachelor of Engineering Technology**

Programs .....	(see front supplement)
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# general admissions information

## ADMISSION

### **The Student Body**

The student body of Lincoln College is composed of recent high school graduates and mature men or women. Most students are employed in industry with vocational experience ranging from very little for the recent secondary school graduate to as much as 20 or 30 years for individuals seeking increased professional responsibility and status. Many technical career categories are represented — industrial, engineering, scientific, and allied-medical — demonstrating that, in our increasingly complex society, the key to personal advancement is education.

### **Academic Background**

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, although they have experience in industry or previous education, have been away from formal study for some time and, therefore, have doubts concerning their study habits and their algebra, geometry, and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in non-credit courses in introductory mathematics, introductory physics, and/or introductory chemistry. These courses are designed to develop adequate background for the basic courses in the degree programs.

### **Program Counseling**

Career planning through self-analysis and professional counseling assists students in planning educational programs appropriate to their objectives. Entering students are encouraged to arrange for personal interviews with Lincoln College program counselors for assistance in planning their academic programs. Counselors are available by appointment at the Huntington Avenue Campus, Boston; the Suburban Campus; Burl-

ington; the North High School, Framingham; the Weymouth North High School or East Junior High School, Weymouth; and the Lynn English High School, Lynn. Students are encouraged to present records of prior education whenever possible. The effectiveness of the counseling review is greatly enhanced by this information. The University, through its Counseling and Testing Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

### **Application for Admission**

Applications for the programs of study offered in the Lincoln College are accepted for admission to the Fall (September), Winter (December), Spring (March), and Summer (June) Quarters. Applications should be filed as early as possible in advance of the opening of the quarter for which the student desires to register in order that eligibility and status may be established.

Information concerning admission may be obtained either by writing to Lincoln College or by requesting it at the time of visiting the College. The application for admission should be completed in detail and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

All inquiries relative to the Day Cooperative programs should be referred to the Day College Admissions office 150 Richard Hall. See front supplement.

### **Mathematics Placement Test**

Applicants requesting admission to regular first-year mathematics are required to demonstrate proficiency in introductory or basic mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the non-credit Introductory Mathematics course are not required to take the test. The Mathematics Placement Test will be administered during the registration period for each term of instruction at the Huntington Avenue Campus, Boston; the Suburban Campus, Burlington; the North High School, Framingham; the Weymouth High School or Annex, Weymouth; and the Lynn English High School, Lynn. In addition, the test is administered during the summer months.

Students who demonstrate satisfactory proficiency in the test will be permitted to register for the first year courses in the program of their choice. To enroll in Engineering Physics (11.317) the student may need to take Introductory Physics.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course. Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry or Engineering Graphics.

In every case the student should carefully consider his combined work and study load and register only for those courses which contribute to the development of a firm knowledge of fundamentals and which enable him to adjust to academic study requirements.

## CLASSIFICATION OF STUDENTS

Applicants who have filed an Application for Admission and who are approved by the Lincoln College Committee on Education are admitted as: (1) Regular Students or (2) Degree Candidates.

### Special Students

A student is enrolled as a "special student" unless he has formally declared himself as a degree candidate and identified the program in which he wishes enrollment.

### Matriculation

Degree candidates must petition for a review of their academic record when they have completed a minimum of forty quarter-hours of work in Lincoln College.

This review will assure that the student has:

1. Attained a satisfactory quality point average.
2. Presented evidence of completion of an accredited secondary school program by submission of a transcript of record or a high school equivalency certificate.
3. Demonstrated acceptable levels of ability and achievement in 15 units\* of secondary school and/or collegiate work as follows:

Verbal Communication	4 units
Mathematics and Computation	3 units
Science and Technology	3 units
Other	5 units

4. The Committee on Admissions may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to completely satisfy the criteria for probable academic success. These tests will be administered by the University Counseling and Testing Center. A fee is charged for these tests.

## TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of Lincoln College.

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\*A unit represents a year's work in a subject at an approved secondary school, community college, junior college, technical institute or university.



Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in the Lincoln College may be obtained by (1) Transfer of Credits or (2) Proficiency Examination.

### **Transfer of Credits**

Subject to the approval of the Committee on Education credits may be awarded for academic work completed in other approved schools, colleges or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in the Lincoln College; (b) the average grade achieved in the course submitted is "C" or higher, and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate this desire at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College office.

### **Proficiency Examinations**

Applicants who do not meet all the criteria for the normal transfer of credits but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience may petition the Committee on Education for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded or a substitute course may be recommended.

### **Readmission**

Former students, who seek readmission to continue a program of study after having withdrawn from the College for a period of time, may be required to repeat courses which are prerequisites to advanced work.

## **REGISTRATION**

### **Registration for Courses**

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

### **Changes in Registration**

Changes in program should be initiated before the opening day of classes during the official registration periods.

### **Official Registration Periods**

Official registration periods are scheduled before the Fall, Winter, Spring, and Summer Quarters during the academic year. Students are urged to register as early as possible during these periods. Dates of registration periods for each quarter are listed in the official 1971-72 Academic Calendar (See page 6).

### **Withdrawal**

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office in writing or complete the appropriate withdrawal form. Properly registered students who do not attend one of the first three sessions in any course will be automatically withdrawn from the class roll. (See page 46 for Refund of Tuition statement.)





# general academic information

## ACADEMIC OPERATIONS

### Campuses and Extensions

All courses are offered at the Huntington Avenue Campus, Boston, with some courses available at the Suburban Campus or Wyman Jr. High School, Burlington; and at North High School, Framingham; English High School, Lynn; North High School or East Junior High School, Weymouth; and, for Aviation Technology students, at the Norwood Airport, Norwood.

### The Quarter Calendar

The regular school year, from September to June, is divided into three quarters of 13 weeks each. Twelve weeks are scheduled for instruction and final examinations with one week available for make-up classes or vacation time. A limited program of courses is offered during the summer quarter.

### Class Sessions

At the Huntington Avenue Campus, lecture periods consist of one hour and forty-minute sessions beginning at 6:30 p.m. or 8:20 p.m. each weekday and at 9:00 a.m. or 10:50 a.m. on Saturdays. At the Suburban Campus, and Wyman Junior High School, Burlington; North High School, Framingham; East Junior High School, Weymouth; Lynn English High School, Lynn; and Norwood Airport, Norwood; lecture periods begin at 8:00 a.m. for day sessions and 6 or 8 o'clock each evening. Design and laboratory courses are of longer duration and may occupy a full evening. All laboratory courses are conducted on the Huntington Avenue Campus.

### Course Work

All of the usual methods of instruction are employed — lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. Students must follow the procedures outlined below for makeup of missed mid-term or final examinations.

### **Student Study Areas**

The UNIVERSITY LIBRARY is well equipped with technical literature. A detailed statement about its facilities and hours appears on pages 23 and 24.

The privilege of obtaining books from the Boston Public Library is extended to students of Lincoln College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Additional study areas are available in the Eli Student Center Building.

### **Attendance**

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence may be sufficient cause for the Registrar to remove the subject(s) from the student's schedule.

### **Withdrawal**

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office or complete the appropriate withdrawal form.

The Registrar will withdraw the student from a course who:

1. Does not attend one of the first three classes at the beginning of a 12 week quarter.
2. Does not attend one of the first two classes at the beginning of a summer term.

## **MAKEUP EXAMINATIONS**

### **Mid-course Examinations**

A student absent from a regularly scheduled mid-course examination or quiz may request permission to take a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or for other reasons.

Students applying for makeup examinations must:

1. Request from the instructor permission to take the midterm examination or quiz.
2. The instructor will forward the examination to the Lincoln College Office for processing.

Makeup mid-term examinations and quizzes will be given on a Saturday at 9:00 a.m. in a designated room at the Huntington Avenue Campus according to the following schedule:

<b>Examination Missed During</b>	<b>Date Scheduled</b>
Fall Quarter	Dec. 12, 1971
Winter Quarter	March 18, 1972
Spring Quarter	June 17, 1972
Summer Terms	In course

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

### **Missed Final Examinations**

If a student is absent from a final examination, he will receive a grade of "I" (Incomplete) in the course. He may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a fee of \$5.00 for taking the special final examination. Petitions may be obtained from the Registrar's Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the schedule listed below:

<b>Final Examination Missed During</b>	<b>File Petition No Later Than</b>	<b>Makeup Final Examination During Week of</b>
Fall Quarter	January 22, 1972	February 14, 1972
Winter Quarter	April 15, 1972	May 8, 1972
Spring Quarter	July 15, 1972	August 7, 1972
Summer Quarter	October 7, 1972	October 30, 1972

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus. Those who do not take makeup final examinations as scheduled forfeit the makeup privilege.

## **ACADEMIC STANDARDS**

The student is required to maintain appropriate levels of academic achievement in terms of grades, quality-point average, and the quantitative credit requirements of his program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

### **Grading System**

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0) — Outstanding	D (1.0) — Poor
B (3.0) — Good	F (0.0) — Failure
C (2.0) — Satisfactory	I (—) — Incomplete

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is definite failure and requires repetition of course in its entirety. An I or X (incomplete) grade is used for a temporary grade to show that the student has not completed the course requirements.

### Grade Reports

Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

### Quality-Point Average

The quality points earned by the student in a given course are determined on the basis of the letter-grade achieved and the number of credit hours carried by the course. The total quality points earned divided by the total number of credit hours constitute the quality-point average.

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
2. A grade of "I" will not be considered in the calculation of the final quality-point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.
4. In programs made up of combined U.C. and L.C. courses, the cumulative quality-point average will include all work in both colleges.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality-point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	× 4 =	16.0
B	3.0	× 4 =	12.0
C	2.0	× 3 =	6.0
D	1.0	× 3 =	3.0
F	0.0	× 2 =	0.0
<del>F</del> B	3.0	× 2 =	6.0
I	—	× — =	—
<del>X</del> C	2.0	× 2 =	4.0
ASC	—	× — =	—
		Totals 20	47.0

$$\text{Quality-Point Average} = \frac{\text{Total Quality Points (47.0)}}{\text{Total Credit Hours (20)}} = 2.350$$

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Lincoln College Committee on Education.

### **Academic Progress Criteria**

It is expected that the student will at all times endeavor to achieve a high record of achievement. The Committee on Education reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.4 at the completion of 24 quarter hours; 1.5 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours.

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue his program of study.

### **Scholastic Probation**

The Committee on Education has the authority to dismiss from the College or place on scholastic probation any student whose scholarship is deficient for the following reasons: low quality-point average, excessive outstanding failures regardless of quality-point average.

A student on scholastic probation should be particularly diligent in his current courses and make every effort to clear his academic deficiencies as soon as possible. Students whose academic record does not improve or whose failures are not properly cleared may not be allowed to register for further courses.

When a student on scholastic probation has cleared all or a substantial part of his outstanding failures he may petition the Committee on Education for removal from the probation list.

### **Disciplinary Probation**

The Committee on Education has the authority to dismiss from the College or place on disciplinary probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

## GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, Bachelor of Engineering Technology or Bachelor of Science the student must fulfill the following requirements:

1. Must have been formally accepted into "degree candidate" status by the Committee on Admissions.
2. Complete all the courses of his particular curriculum, either by attendance at the Lincoln College or by receiving Advanced Standing Credit.
3. Complete associate-degree programs in eight years and bachelor's programs in 12 years from the date of entrance into Lincoln College. Extensions of time may be granted by the Committee on Education.
4. Be in attendance for at least a year preceding the date on which he expects to graduate; and he must complete at least one fourth of his work in Lincoln College.
5. Achieve a quality-point average of at least 1.75 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degrees and 1.80 for the Bachelor of Engineering Technology degree, and 2.00 for the Bachelor of Science degree.
6. Pay the Graduation Fee of \$25.

*In addition students:*

7. May not earn two associate degrees or two bachelor degrees in the same field of academic specialization.
8. Must complete a minimum of 30 quarter hours of additional credits to be awarded more than one associate or bachelor degrees.
9. May not be awarded the associate and bachelor degree at the same commencement.
10. Must petition for transfer of credits completed at other institutions prior to January 1 of the year in which the degree is to be awarded.

### Attendance at Commencement

All candidates for a first degree (bachelor or associate) are required to attend commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate family illness, military service, or obligations beyond the control of the candidate. A petition to receive a degree in absentia must be presented to the Dean of the College.

## ACADEMIC AND PROFESSIONAL AWARDS

The academic programs offered by the Lincoln College and the teaching, counselling, and professional efforts of the faculty and staff are aimed at motivating the student toward the highest possible levels of academic achievement. To encourage scholarly and professional excellence and to

recognize quality achievements the following awards are made at appropriate times during the academic year:

### **Honor List and Dean's List Scholars**

Students maintaining honor grade averages — minimum quality average of 3.000 and no "D" grades — during a quarter while carrying a minimum of 6 quarter hours credit are recognized as Dean's List Scholars. Students desiring certificates attesting to this honor should request them from the Lincoln College Office.

### **Scholastic Achievement Certificates**

Upon graduation with an associate degree, Scholastic Achievement Certificates will be awarded to those students who have achieved distinctly superior attainment in the academic work as follows:

Scholastic Achievement	3.000-3.499 Q.P.A.
High Scholastic Achievement	3.500-3.749 Q.P.A.
Highest Scholastic Achievement	3.750-4.000 Q.P.A.

In order to be eligible for a Scholastic Achievement Certificate the student must earn a minimum of 48 quarter hours of credit in Lincoln College.

### **Graduation with Honor**

Upon graduation, honors will be conferred upon students who have achieved distinctly superior academic achievement in a program leading to the Baccalaureate Degree as follows:

Honor	3.000-3.499 Q.P.A.
High Honor	3.500-3.749 Q.P.A.
Highest Honor	3.750-4.000 Q.P.A.

In order to be eligible for Honors the student must earn a minimum of 72 quarter hours credit in Lincoln College and receive a vote of approval from the faculty with responsibility for his program.

### **University Awards**

The University Awards are presented annually to seniors, pursuing associate degree programs, who have achieved high ranking cumulative academic records. The tuition scholarship awards are accompanied by an appropriate certificate.

### **Lincoln College Faculty Scholarship Award**

The faculty encourages the achievement of scholarship by making monetary awards.

The Faculty Scholarship Fund was established in 1969 by voluntary contributions of the Lincoln College Faculty.

The Scholarship Committee determines the number and size of awards based on available funds.

The basis of the award is determined by need, academic achievement and personal qualifications. The Scholarship Committee invites applications by announcing the specific requirements of eligibility during the school year.



### **Technology Awards**

The Technology Awards are presented annually to seniors, pursuing associate degree programs, who have demonstrated superior academic and professional capabilities in their special career fields. The scholarship awards and appropriate certificates are distributed to outstanding students enrolled in the following program categories:

- Allied-Medical Technology
- Civil Engineering Technology
- Commercial Aviation Technology
- Computer Engineering Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Science Technology

### **Class Marshal Award**

The Class Marshal Award is presented annually at the Class Day Banquet for Graduates to the top ranking senior in a baccalaureate program. The award consists of an appropriate certificate, a selection of books, and the President's Letter of Commendation.

### **Sigma Epsilon Rho Awards**

Sigma Epsilon Rho, the evening colleges scholastic honor fraternity, annually awards plaques and scholarships for outstanding scholastic achievement to the highest ranking male students in University and Lincoln Colleges.

### **Alumni Award for Professional Promise**

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at a final senior class meeting in the spring of the year. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and work performance.

### **E. W. Wiggins Aviation Awards**

The E. W. Wiggins Aviation Awards provide scholarship aid to students, enrolled in the Commercial Aviation Technology Program, who, in the judgement of the Northeastern University-Wiggins Airways Advisory Committee, have demonstrated the highest degree of proficiency in flying and related courses during the academic year.

### **Leslie B. Cutler Aviation Awards**

The Leslie B. Cutler Aviation Awards were established by the members of the Aero Club of New England to honor and give recognition to Senator Cutler's service and devotion to the interests of aviation in the Massachusetts General Court, national legislative bodies, and her private life. These scholarship awards are made to students in the Commercial Aviation Technology Program who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.



# general financial information

## TUITION

Students are expected to meet their financial obligations to the University or to make satisfactory arrangements with the Bursar's Office in order to be permitted to attend class sessions, to advance in class standing, to re-enroll after withdrawal, or to be conferred a degree. A certificate of honorable dismissal will be issued only to students who have a satisfactory financial standing. Checks should be drawn payable to Northeastern University.

Tuition, payable each quarter, is dependent upon the number of courses in which a student is enrolled. The following schedule indicates the tuition for courses and programs offered by the Lincoln College:

### *Regular Course Tuition Per Quarter*

<i>Course Credits</i>	<i>\$26.00 per Q.H.</i>
2 Q.H.	\$ 52.00
3 Q.H.	\$ 78.00
4 Q.H.	\$104.00
6 Q.H.	\$156.00

Non-credit courses are charged at quarter hour rates comparable to those of credit courses meeting on an equivalent contact-hour schedule.

### **Commercial Aviation Technology Programs**

*Regular Academic Courses* *\$26.00 per Q.H.*

#### **Flight Courses**

Primary Flight	I \$580.00	II \$460.00	III \$440.00		
Commercial Flight	I \$432.00	II \$432.00	III \$432.00	IV \$483.00	V \$507.00
Certified Flight Instructor	I \$438.00	II \$465.00			
Instrument Flight	I \$515.00	II \$535.00	III \$515.00		

*(These rates cannot be guaranteed beyond the current academic year.)*

**Refunds:** A student who drops out of the course prior to completing his block of flight time shall be charged for all dual, solo, and ground time at the regular Wiggins-Northeastern rates and the balance of his account shall be refunded.

**Additional Time:** Students requiring additional time beyond the prescribed course limits shall be charged for such time at the regular Wiggins-Northeastern rates.

**Flight Tests:** Flight tests are not included in the regular course curriculum. Charges will be made for the Commercial Flight Test and the Instrument Flight Test on the basis of 1½ hours of aircraft and 1½ hours of ground time at the regular Wiggins-Northeastern rate. The Instructor Flight Test which must be given by a regular FAA Examiner requires 1½ hours of aircraft time only.

**Radiologic Technology Program**

First Two Years of Program	\$800.00 Total
Third and Fourth Year Courses	\$ 26.00 per Q.H.

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter. As a convenience without additional charge, and at the student's request, the Bursar's Office will allow payment in two installments.

**Deferred-Payment Privilege**

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances the student is advised to discuss his problem personally with the Bursar's Office where a convenient deferred payment agreement can be worked out. A service fee of \$2 is charged for this privilege.

**Late Payment Fee**

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment, or a deferred payment agreement is not arranged by that date, a late fee of \$10 is charged by the Bursar.

**Refund of Tuition**

The Registrar's Office, 120 Hayden Hall, must be notified on an official form of a student's withdrawal. All refund adjustments are computed as of the date on which the official withdrawal slip is filed in the Registrar's Office.

**Tuition Underwritten by Employers**

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

**Student Bursar**

All inquiries about student accounts should be directed to the Student Account Bursar, 437-2270.

**SPECIAL FEES****Student Center Fee**

Students attending the Huntington Avenue Campus, Boston, in the evening in a part-time program of study will be assessed a Student Center Fee of 75¢ per quarter. Students attending this campus full-time during the first year of the Radiologic Technology Program are assessed a Student Center Fee of \$18.75.

**Health Service Fee**

Students attending the Huntington Avenue Campus, Boston, full-time in the first year of the Radiologic Technology Program are required to pay a Health Service Fee of \$75.00.

**Laboratory Fee**

All students enrolled in chemistry or biology courses which include laboratory must purchase from the Bursar's Office a Laboratory Fee and Deposit Card for \$15.00 (\$5 for extra cards). Upon completion of the course or withdrawal during the quarter, the student must check out his status with the laboratory attendant. The Bursar's Office will then refund any unused balance shown on the Laboratory Fee and Deposit Card.

**Special Final Examination Fee**

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is \$5. The fee must be paid when the petition is filed in the University Registrar's Office.

**Proficiency Examination Fee**

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examination." The fee for each examination requested by the applicant is \$10. The fee must be paid when the petition is filed in the Lincoln College Office.

**Graduation Fee**

The University graduation fee, charged to those who are candidates for the associate or bachelor's degree, is \$25, payable on or before May 1 of the year in which the student expects to graduate.

**Transcript of Record Fee**

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of \$1 per copy, payable in advance. If more than one transcript is requested at one time the charge is \$1 for the first copy and 50¢ for each additional copy.

**TEXTBOOKS AND SUPPLIES**

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally ranges from \$25 to \$50. Textbooks for single courses range from \$4 to \$15.

Students enrolled in Engineering Graphics should be prepared to spend \$10 to \$15 for drawing supplies and \$10 to \$20 for a set of drawing instruments in addition to the textbooks.

## LOAN PROGRAMS

### National Defense Student Loan Program

Any student in good standing who can demonstrate financial need is eligible to apply to the Director of Financial Aid for Students at Northeastern for assistance under the National Defense Student Loan Program. Recipients of the loans are selected by the University. The law requires that each borrower be at least a half-time student, in need of the amount of the loan, and capable of maintaining a good standing in his chosen course of study.

A student may borrow up to \$1,000 in one year, and a maximum of \$5,000 during his entire college career. Special consideration is given to superior students.

Loans to students who plan to teach in elementary and secondary schools or in institutions of higher education after graduation will be canceled up to a maximum of 50 per cent at the rate of 10 per cent for each year of such teaching. No interest is charged on loans until one year after graduation. Thereafter, interest is paid at the rate of 3 per cent per year. Borrowers may have up to 10 years to repay.

### Higher Education Loan Plan (HELP)

The Massachusetts Higher Education Assistance Corporation was chartered in 1956 by the Massachusetts legislature to aid young men and women of the state to complete their programs of higher education. Students who are residents of Massachusetts and who have satisfactorily completed the freshman year are eligible for HELP loans. Loans are generally limited to \$1,000 in any one academic year, with an over-all limitation of \$3,000.

Full information and the required application forms may be obtained from any of the national banks and trust companies in Massachusetts participating in the program.

This plan is also used by most other states and Canada to provide assistance for undergraduate or graduate students. In New York, New Jersey, and Rhode Island, freshmen are eligible to borrow under this program. Students should check with their state Higher Education Assistance Corporation for further details.

### University Long-Term Loan Fund

Northeastern maintains a loan fund for the purpose of aiding students in meeting their tuition expenses from quarter to quarter.

This fund is in many ways similar to the National Defense Loan Fund. Money borrowed need not be repaid until after graduation; and interest, at the rate of 3 per cent, does not become effective until one year after that time.

Students who qualify for this assistance may borrow as much as full tuition for any given quarter. **The University does not award financial assistance in any form to non-citizens of the United States.**

**The New England Society Student Loaning Fund**

The purpose of this revolving Student Loaning Fund, established by the New England Society, is to make available to deserving students, especially those of New England birth or ancestry, small amounts of money as temporary loans to meet emergencies.

It is not intended to be used for large loans to cover scholarship, board, or room rent, or for loans which will be outstanding more than three months.

**Martin Luther King, Jr. Scholarship Fund**

A number of scholarship awards have been established by the University in the memory of Reverend Martin Luther King, Jr. to enable young adults of the black community to upgrade their education through part time study. Interested students should contact the office of Financial Aid in Room 252 Richards Hall.



# student activities and alumni information

## **Adult Student Council**

The Adult Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and administrative staff.

The Adult Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of students appointed by the administration, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The A.S.C., a member of the International Association of Evening Student Councils, meets on the first Monday of each month at 8:30 p.m. Students are welcome to visit, observe, and express opinions concerning evening student life.

## **Social and Professional Clubs**

Students in the several professional programs of the Lincoln College combine to operate clubs which hold regular meetings. Practicing professionals address the groups, appropriate motion pictures are shown, group visits to current engineering science and clinical projects and facilities are conducted. Chief among these at present are the following:

- Civil Engineering Technology Club
- Electrical Engineering Technology Club
- Mechanical Engineering Technology Club
- Medical Technology Club
- N.U. Computer Club
- Psychology Club

The Lincoln College encourages these technical interest groups in the belief that they provide wholesome socialization, worthwhile personal development opportunities and valuable introductions to professional life.

Students interested in forming other professional clubs may obtain information by contacting members of (1) The Student Activities Office, (2) Adult Student Council, or (3) the Lincoln College Office.

### **Society for the Advancement of Management**

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management professional. Meetings, conferences, and seminars are held.

### **Pi Tau Kappa Fraternity**

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to enhance their social welfare and promote closer affiliation with the University.

### **Kappa Tau Phi Sorority**

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students and to form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

### **Alumni Association**

More than 38,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 260 of the United Realty Building.

The official publication of the Alumni Association, **The Northeastern University ALUMNUS**, is published quarterly and sent free of charge to all alumni on record.



Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 40 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

### **Alumni Relations**

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

### **Placement Service**

Many requests from employers are received by the College, for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College, however, cannot guarantee



to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best equipped and qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally request the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.

# academic programs of instruction

## SCOPE OF PROGRAMMING

The Lincoln College and Lincoln College in collaboration with University College, the Center for Continuing Education, the Wiggins Airways, Inc., and Hospitals in New England conducts educational programs at the undergraduate level in the following areas of technology:

- Pre-Technology Preparation
- Allied-Medical Technology
- Aviation Technology
- Science Technology
- Civil Engineering Technology
- Electrical Engineering Technology
- Mechanical Engineering Technology
- Computer Engineering Technology

## Degrees and Certificates

Lincoln College conducts education programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 to 99 quarter hours of credit.
2. Associate in Engineering degree (A.E.) requiring 96 quarter hours of credit.
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 quarter hours of credit.
4. Certificates may be earned with a minimum of 30 quarter hours of credit.
5. Most courses are available for special students.

*Lincoln College collaborates with University College in programs leading to:*

6. Bachelor of Science degree (B.S.) requiring 174 to 180 quarter hours of credit.

## Opportunities for Associate Degree Graduates

Graduates of the engineering or science technology programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degrees, may transfer applicable credits toward the degree requirements in the baccalaureate programs in engineering technology, medical technology, or industrial technology.

Those who have maintained a quality-point average of 2.500 or higher in the associate degree programs may transfer to either of the following College of Engineering curricula: (1) day-college Cooperative Education programs in civil, mechanical, electrical or industrial engineering with credit for up to two years of the five-year program, or (2) the part-time evening programs in civil or electrical engineering with credit for the first two years of the eight-year programs.

## **PRE-TECHNOLOGY PREPARATION**

(Non-Credit)

Beginning students, who have been away from formal study for some time, frequently are concerned about their study habits and their verbal, mathematical, and scientific backgrounds. Applicants who anticipate some problems should give serious consideration to enrolling in the non-credit introductory courses, the reading improvement program, or doing review work through programmed instruction.

### *Introductory Courses*

*These courses are designed to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.*

#### **Introductory Mathematics I and II**

A two-quarter review of high school algebra and some plane geometry designed to prepare students for the credit course in 10.307 College Algebra and Trigonometry I. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course description for 10.301 and 10.302 page 113.)

#### **Introductory Physics I and II**

A two-quarter relatively non-mathematical introduction to the concepts of physics designed to prepare students for the credit courses in 11.317 Physics I or 11.304 General Physics I. (See course description for 11.301 and 11.302, page 115.)

#### **Basic Mathematics I and II**

A two-quarter review of basic algebra designed to prepare students for the credit course in 10.501 Mathematics I. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course descriptions for 10.330 and 10.331, page 113.)

#### **Introductory Chemistry I and II**

A two-quarter relatively non-mathematical introduction to the concepts of chemistry designed to prepare students for the credit sequence in 12.314 General Chemistry and Laboratory 1, or 12.307 Modern Chemistry I. (See course description for 12.301 and 12.302, page 117.)

**English for International Students I, II, III**

A three quarter, non-credit sequence for foreign speaking students covering introduction to English grammar with emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation; preparation of written and oral reports, business and social correspondence; and advanced work in written and spoken English preparatory to entering 30.601 Composition and Rhetoric I.

*Reading Improvement*

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases, identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading, and critical reading. Further information may be obtained at the Center for Reading Improvement.

*Programmed Study*

Students may enroll in non-credit, self-study courses to better prepare themselves for college academic work and strengthen their high school background at the University's Center for Programmed Study.

Courses which may be useful to students in the Lincoln College programs in technology are:

Slide Rule	Trigonometry	Effective Listening	Spelling
Algebra	Study Skills	Calculus	English

The Center is open Monday through Thursday from 8 a.m. to 10 p.m.; Friday from 8 a.m. to 6 p.m.; Saturday from 8:30 a.m. to 12:30 p.m.; and Sunday from 1 p.m. to 5 p.m. Descriptions and full information may be obtained at the Center for Programmed Study. For further information call 437-2465.

**ALLIED-MEDICAL TECHNOLOGY PROGRAMS**

The Allied-Medical Technologies encompass the newly emerging category of occupations concerned with the applications of the biological, engineering, natural, and physical sciences in the technological service fields which support the health, medical, and pharmaceutical professions.

The need for competent technological specialists has been created by greater knowledge resulting from biological, chemical, medical, and pharmaceutical research; technological developments in the fields of laboratory analysis, nuclear and radiological technology; and the increased use of sophisticated equipment and electronic instrumentation. The demand for these new technologists exists in hospitals, clinics, and public health organizations; biological and pharmaceutical research foundations; the chemical and drug industries; and organizations which design, develop, and manufacture equipment for these fields.

In response to this need, Lincoln College has expanded its offerings to include the biology, chemistry, and other special clinical technology courses which provide the technological core for the Allied-Medical Technologies.

The Allied-Medical Technology related programs offered by Lincoln College are:

*Associate in Engineering Degree*

Bioelectronic Engineering Technology ..... page 58

*Associate Science Degree*

Radiologic Technology ..... pages 59-60

*Bachelor of Science Degree*

Cytotechnology ..... pages 61-62

Medical Technology ..... pages 63-64

**Bioelectronic Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Bioelectronics Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording, and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry, and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological, and pharmaceutical research laboratories; in clinics and hospital in relation to medical diagnosis and patient care; as well as in industrial organizations concerned with the design, development, and production of the equipment.

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra and Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics, I, II, III	6
10.321, 10.322, 10.323	Calculus, II, III, IV	6
12.307, 12.308, 12.309	*Modern Chemistry I, II, III	6
<b>Third Year</b>		
03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements and Electronic Lab.	6
11.320	Semiconductor Physics and Devices	4
03.311, 03.312	Electronics I, II	8
18.307, 18.308, 18.309	Gross Anatomy and General Physiology I, II, III	6
<b>Fourth Year</b>		
03.351, 03.352, 03.353	Bioelectronic Devices I, II, III	6
03.357, 03.358, 03.359	Bioelectronic Lab. I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	Technical Elective	6
Total A.S. degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

\*Student may elect 12.314, 12.315, 12.316 General Chemistry and Laboratory I, II, III (9 q.h.)

**Radiologic Technology***Leading to the Degree of Associate in Science*

The program in Radiologic Technology is a joint Lincoln College-Center for Continuing Education offering with radiologic laboratory practicum conducted at approved Hospital Schools of Radiologic Technology accredited by the Council on Education of the American Medical Association. The Committee on Radiologic Technology of the New England Roentgen Ray Society and representatives from the Massachusetts Society of Radiologic Technologists serve in advisory capacities concerning curriculum content.

The Radiologic Technologist is a respected member of the paramedical team in the diagnostic and therapeutic environment of the clinic or hospital and an important functionary in the production, quality control and inspection laboratories of the industrial community. Medically related responsibilities demand effective rapport with doctors, surgeons, pathologists, or nurses while industrial competency requires close associations with metallurgists, production and manufacturing specialists, and engineers or scientists.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331) and acceptance by an A. M. A. accredited School of Radiologic Technology which is affiliated with Northeastern University.

Have an interview with the Radiological Technology Program counsellor of the Lincoln College.

Be acceptable to the affiliated hospital through an interview with the Radiologist.

**First Year**

Eight alternating 2-week terms of full-time didactic study at Northeastern University and 4-week terms of full time radiologic practicum and seminars at the affiliated Hospital Schools.

*Didactics — 16 weeks (at Northeastern University)* Q.H.

10.501, 10.502, 10.503	Mathematics I, II, III	6
18.307, 18.308, 18.309	Gross Anatomy and Gen'l Physiology I, II, III	6
86.301, 86.302, 86.303	Radiologic Technology Orientation I, II, III	3
86.304, 86.305, 86.306	Radiologic Science I, II, III	9
86.311, 86.312, 86.313	Principles of Radiology I, II, III	9
86.331, 86.332, 86.333	Radiologic Photography & Exposure I, II, III	6

*Practicum — 34 weeks (at Hospital Schools of Radiologic Technology)*

86.341, 86.342, 86.343	Applied Radiology & Practicum I, II, III	6
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**Second Year**

Full-time attendance at the affiliated Hospital Schools of Radiologic Technology (52 wks @ 40 hrs/wk = 2080 hrs)

86.344, 86.345, 86.346	Advanced Radiology & Practicum	6
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Students who satisfactorily complete the first and second year of didactics and practicum are eligible to: Take the American Radiologic Technology examination for certification as a Radiologic Technician (R.T.).

**Third Year**

Three Quarters (36 weeks) part-time evening study at Lincoln College.

		Q.H.
18.311, 18.312, 18.313	Biology I, II, III	12
30.601, 30.602	Composition & Rhetoric I, II	4
	English Elective	2
86.314, 86.315, 86.316	Adv. Radiologic Technology I, II, III	6

**Fourth Year**

19.501, 19.502, 19.503	Psychology I, II, III or	
21.501, 21.502, 21.503	Sociology I, II, III	6
45.501, 45.502, 45.503	Management & Organization I, II, III	6
86.317, 86.318, 86.319	Radioactive Isotopes & Therapy I, II, III	6
	Humanities Elective I, II, III	6

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 Total A.S. degree 99

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Qualified students may accelerate completion of the program by enrolling in third or fourth year evening courses during the second, internship year upon petition for approval by the Director of Radiologic Technology in Lincoln College and the Radiologist in charge of the Hospital School of Radiologic Technology involved.



**Cytotechnology***Leading to the Degree of Bachelor of Science*

A program offered through the cooperating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science Degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the boarder field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but also sound academic background.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
	or	
*10.307, 10.308	College Algebra & Trigonometry I, II	8
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

**Second Year**

10.316, 10.317, 10.318	Probability and Statistics I, II, III	} 6 or 8 12 6
	or	
10.320, 10.321, 10.322	Calculus I, II, III	
18.311, 18.312, 18.313	Biology I, II, III	
23.502, 23.503, 23.504	Western Civilization I, II, III	6

**Third Year**

12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	9
19.501, 19.502, 19.503	Psychology I, II, III	6

**Fourth Year**

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.321, 18.322, 18.323	Microbiology I, II, III	12

\*Students planning to transfer to the Day College program are advised to take 10.307 and 10.308.

Fifth Year			Q.H.
18.351, 18.352, 18.353	Histology-Organology I, II, III		6
86.504, 86.505, 86.506	Foundations of Medical Science I, II, III	}	6
	or		
86.507, 86.508, 86.502	Medical Terminology I, II, Hospital Law and Ethics		
12 months	AMA-Approved Hospital School of Cytotechnology Internship		15†
Sixth Year			
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III		6
73.311, 73.312, 73.313	Clinical Biochemistry I, II, III		6
	Elective		6
	Elective		6
Seventh Year			
18.341, 18.342, 18.343	Hematology I, II, III		6
30.604, 30.605	Intro. to Lit. Forms I, II		4
	English Elective		2
	Elective		6
Total B.S. degree			176 minimum

\*It is recommended that students planning to take calculus in the second year take 10.307 & 10.308 in the first year.

†Student will take Registry Examination at the end of hospital training period before academic credit for hospital school phase is officially granted.

**Medical Technology***Leading to the Degree of Bachelor of Science*

The program in Medical Technology is a joint Lincoln College–University College program which is conducted in affiliation with several Hospital Schools of Medical Technology approved by the American Medical Association. The program leads to the Bachelor of Science Degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors, and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

The Registered Medical Technologist is in constant demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations, and in the Armed Forces.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
	or	
10.307, 10.308	College Algebra & Trigonometry I, II	8
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

**Second Year**

10.316, 10.317, 10.318	Probability and Statistics I, II, III	} 6
	or	
10.320, 10.321, 10.322	Calculus I, II, III	} 8
18.311, 18.312, 18.313	Biology I, II, III	
23.501, 23.502, 23.503	Western Civilization I, II, III	6

**Third Year**

12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	9
19.501, 19.502, 19.503	Psychology I, II, III	6

**Fourth Year**

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.321, 18.322, 18.323	Microbiology I, II, III	12

\*Students who are planning to transfer to the Day College program are advised to take 10.307 and 10.308.

Fifth Year		Q.H.	
73.311, 73.312, 73.313	Clinical Biochemistry I, II, III	6	
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6	
86.504, 86.505, 86.506	Foundations of Medical Science I, II, III	}	6
	or		
12.351, 12.352, 12.353	Instrumental and Radiochemistry I, II, III	}	6
	*Elective		
Sixth Year			
12 months Internship at a A.M.A.-Approved Hospital School of Medical Technology		30	
Seventh Year			
18.341, 18.342, 18.343	Hematology I, II, III	6	
30.604, 30.605	Intro. to Lit. Forms I, II	4	
	English Elective	2	
18.357, 18.358, 18.359	Genetics I, II, III	6	
	*Elective	6	
Total B.S. degree		180-184	

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\*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

## AVIATION TECHNOLOGY PROGRAMS

The Aviation Technology programs offered by Lincoln College in cooperation with Wiggins Airways are designed to provide the scientific, technological, and business backgrounds required by the modern commercial pilot or entrepreneur in today's aviation and aero space world as it operates in the framework of the total ship-rail-motor-aircraft transportation industry.

The tremendous expansion of aviation as an increasingly important sector of the nation's industrial economy has accelerated the demand for appropriately trained and educated personnel for careers related to the flight, instructional, regulatory, and management aspects of the air industries.

Flight opportunities range from pilot or co-pilot in the single- or multi-engine air-taxi and cargo services of the local, fixed-base feeder airlines or private company to flight engineer, first officer or captain in the high-speed, multi-jet-engined services of the national and international systems of the major airlines when appropriate additional flight experience and training are acquired.

The education-training-regulation sector of the aviation industries provides additional career opportunities as flight, ground or simulator instructors or as flight examiners, training or safety directors and supervisors in the licensing and regulatory agencies of local, state or federal government.

Persons knowledgeable in the technology and regulation of aviation, who are also skillful in dealing with people, may pursue challenging and rewarding careers in aviation sales, airport operations, aviation business management, etc.

The Aviation Technology related programs presently offered by Lincoln College are:

### *Associate in Science Degree*

#### Commercial Aviation Technology

Evening program (4 years) . . . . . page 67

Day program (2 years) . . . . . page 68

#### **Wiggins Airways**

Wiggins Airways has been in operation since 1929. Their facilities are located at Norwood Airport, 15 miles from the main Northeastern University campus, provide the flight training courses for the Aviation Technology programs offered by Lincoln College. They offer air taxi, rental, maintenance, repair, aircraft service parts, electronics, and helicopter services. Wiggins is the New England distributor for Piper Aircraft.

The airport facilities comprise two 4,000' runways, one with high intensity lights; a Federal Aviation Administration control tower in operation

from 8 a.m. to 8 p.m. every day of the year; "H" facility (navigational aid for radio location); two Unicom frequencies for radio communication; and weather teletype service. Modern, air-conditioned classroom facilities, with visual aids, library, and other study aids are available for academic and ground related courses.

The aircraft fleet consists of eighteen Piper Cherokee 140's; two Piper Cherokee 180's; one Piper Cherokee 6; plus the following: Piper Twin Engine Aircraft — Comanche, Aztec and Navajos, two Flightmatic Simulators; a General Aviation Training Simulator and a Jet Training Simulator. All aircraft are maintained on the premises in a federally certified aircraft repair station which is also Piper factory certified.

The Flight dispatch and instructional staff consists of 25 + persons all thoroughly qualified by education; training, certifications; and ratings to perform their functions with flight students.



**Commercial Aviation Technology***Leading to the Associate in Science Degree*  
(Evening Program — 4 years)

The Evening Curriculum Option of the Commercial Aviation Technology program is designed for students who need to be employed while pursuing academic work on a part-time basis.

The academic instruction and flight time accumulated in the program thoroughly prepares the student for certification with the Commercial, Instrument and Instructors ratings by the Federal Aviation Administration. This 12 quarter — 4 year evening program includes the same scientific, technological, and business content provided by the 6 Quarter — 2 year day program. Graduates will be eligible for employment in a variety of positions including: Flight Crew Officers, Flight Instructors, Airport Management, Fixed Base Operations, Air Transportation, Aviation Sales, F.A.A. positions, etc.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or Basic Mathematics I & II (10.330 & 10.331). Medical Certificate — F.A.A. Class I or II. Interview with Director of Flight Instruction and Aviation Program Counsellor.

**First Year**

Total Yearly Q.H.

10.501, 10.502, 10.503	Mathematics I, II, III	6
11.304, 11.305, 11.306	General Physics I, II, III	6
96.301, 96.302, 96.303	Air Science & Navigation I, II, III	6
96.331, 96.332, 96.333	Primary Flight I, II, III	4½

**Second Year**

30.601, 30.602	Composition & Rhetoric I, II,	4
	English Elective	2
48.541, 48.542, 48.543	Air Transportation I, II, III	6
96.311, 96.312, 96.313	Aviation Meteorology I, II, & Climatology	6
96.304, 96.305, 96.306	Adv. Air Science & Navigation I, II, III	6
96.341, 96.342, 96.343	Commercial Flight I, II, III	4½

**Third Year**

20.501, 20.502, 20.503	Sociology I, II, III	} 6
or		
19.501, 19.502, 19.503	Psychology, I, II, III	
48.501, 48.502, 58.503	Transportation Management I, II, III	
03.307, 03.308, 03.309	Electrical & Electronic Principles I, II, III	
96.344, 96.345	Commercial Flight IV, V	3
96.351	Instructional Flight I	1½

**Fourth Year**

	Humanities Elective I, II, III	6
41.501, 41.502, 41.503	Accounting I, II, III	6
96.321, 96.322, 96.323	Avionics I, II, III	6
96.352	Instructional Flight II	1½
96.354	Principles of Flight Instruction	2
96.361, 96.362, 96.363	Instrument Flight I, II, III	4½

Total A.S. degree 99½

**Commercial Aviation Technology***Leading to the Degree of Associate in Science  
(Day Program — 2 years)*

The Day Curriculum Option of Commercial Aviation Technology program is designed to provide, in the shortest reasonable time, the required amount of related academic instruction and accumulated flight time to thoroughly prepare the student for certification with the Commercial, Instrument and Instructor's Ratings by the Federal Aviation Administration. In the two year program the student will acquire the scientific, technological and business background for employment in a variety of positions including: Flight Crew Officers, Flight Instructors, Airport Management, Fixed Base Operations, Air Transportation, Aviation Sales, F.A.A. positions, etc.

*Prerequisites:* Satisfactory completion of the Mathematics Placement Test or Basic Mathematics I & II (10.330 & 10.331) Medical Certificate — F.A.A. Class I or II. Interview with Director of Flight Instruction, and Aviation Program Counsellor.

<b>First Year</b>		Total Yearly Q.H.
10.591, 10.592	Mathematics A & B	6
11.391, 11.392	Gen. Physics A & B	6
30.601, 30.602	Comp. & Rhetoric I & II	4
	English Elective	2
96.391, 96.392	Air Sci. & Nav. A & B	6
19.501, 19.502, 19.503	Psychology I, II, III	6
96.393	Adv. Air Science & Nav. A	3
96.395	Meteorology & Climatology A	3
03.394	Elec. & Electronics Principles A	3
48.591	Transportation Management A	3
96.331, 96.332, 96.333	Primary Flight I, II, III	4½
96.343, 96.344, 96.345	Comm. Flight I, II, III	4½
96.346	Comm. Flight IV	1½

<b>Second Year</b>		
03.395	El. & Electronic Principles B	3
48.592	Trans. Mgmt. B	3
96.396	Meteorology & Climatology B	3
96.394	Adv. Air Science & Navigation B	3
96.397, 96.398	Avionics A & B	3
48.593, 48.594	Air Transportation A & B	6
41.551, 41.552	Accounting A & B	6
23.509, 23.510	Western Civilization A & B	6
96.354	Principles of Flight Instruction	2
96.347	Commercial Flight V	1½
96.361, 96.362, 96.363	Instrument Flight I, II, III	4½
96.351, 96.352	Instructional Flight I, II	3

Total 99½



## SCIENCE TECHNOLOGY PROGRAMS

The Science Technology programs offered by Lincoln College present a variety of interdisciplinary combinations of the theoretical and basic sciences (biology, chemistry, mathematics, physics) rather than the applied and engineering sciences, emphasized in the Engineering Technology programs. In contrast to the Engineering Technology programs which concentrate heavily on application, design, efficiency and cost, the Science Technology curricula devote more courses to theoretical concepts, analytical methods and laboratory investigating techniques. Where employment opportunities for the engineering technologist lie in organizations and industries concerned with present-day engineering, design, and production methods, the science technologist will find his opportunities concerned with the frontiers of knowledge and the newly emerging sciences.

Organizations dealing with nuclear, environmental, meteorological, oceanographic, chemical, and physical research as well as the pharmaceutical, hospital clinical laboratories or agencies concerned with health and medicine are likely places of employment.

### *General Science Teaching Option*

Graduates of the baccalaureate program in Chemical-Biological Technology, who have maintained a quality-point average of 2.300 or higher and have included courses in Adolescent Psychology and Principles of Teaching among their electives may apply for admission to the Northeastern University Graduate School of Education in which requirements for teacher certification and the Master of Education degree may be completed.

The Science Technology related programs offered by Lincoln College are:

### *Associate in Science Degree*

Chemical-Biological Technology .....	page 70
Chemical-Physical Technology .....	page 71
Mathematical-Physical Technology .....	page 72

### *Bachelor of Science Degree*

Chemical-Biological Technology .....	pages 73-74
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**Chemical-Biological Technology***Leading to the Degree of Associate in Science*

The program in Chemical-Biological Technology provides the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically, or biologically oriented organizations, and for persons having various paramedically related responsibilities. Employment opportunities are in general hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments; and in the emerging fields of the oceanographic technologies.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	} 6
	or	
10.307, 10.308	College Algebra & Trigonometry I, II	8
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.601, 30.602	Composition & Rhetoric I, II	4
	English Elective	2
<b>Second Year</b>		
10.316, 10.317, 10.318	Probability and Statistics I, II, III	} 6
	or	
10.320, 10.321, 10.322	Calculus I, II, III	8
	Social Science Elective I, II, III	6
18.311, 18.312, 18.313	* Biology I, II, III	12
<b>Third Year</b>		
12.331, 12.332, 12.333	Organic Chemistry I, II, III	} 6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	
	or	6
12.321, 12.322, 12.323	Analytical Chemistry I, II, III	} 9
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	9
	* Humanities Elective I, II, III	6
<b>Fourth Year</b>		
18.321, 18.322, 18.323	Microbiology I, II, III	12
	* Biology or Chemistry Elective I, II, III	6
<b>Total A.S. degree</b>		<b>96-100</b>

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

\*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

**Chemical-Physical Technology***Leading to the Degree of Associate in Science*

The program in Chemical-Physical Technology prepares the graduate to assume responsibilities related to the analysis, synthesis, and production of products involving chemical as well as physical changes. The curriculum provides both theoretical and laboratory training in the traditional branches of chemistry but also includes modern instrumental, radiochemistry, and nuclear technology. It provides broad rather than specialized training so as to have applicability in many chemistry-related fields. Employment opportunities are in manufacturing and pharmaceutical plants producing drugs, oils, synthetics, and plastics; as well as in private and industrial research laboratories concerned with the development of processes, by-products and new knowledge.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9

**Second Year**

10.321, 10.322, 10.323	Calculus II, III, IV	6
12.321, 12.322, 12.323	Analytical Chemistry, I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

**Third Year**

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
11.331, 11.332, 11.333	Advanced Physics, I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

**Fourth Year**

12.341, 12.342, 12.343	Physical Chemistry I, II, III	6
12.351, 12.352, 12.353	Instrumental and Radiochemistry	6
12.381, 12.382, 12.383	Nuclear Technology I, II, III	6
	Elective I, II, III	6

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Total A.S. degree 99

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

**Mathematical-Physical Technology***Leading to the Degree of Associate in Science*

The program in Mathematical-Physical Technology is designed to establish a firm background in the concepts of physics and mathematics with sufficient chemistry to allow effective communication between technologist and professional. The intensity of courses introduces theoretical depth for concept development but places emphasis at the level of application and performance.

Graduates may serve as high-level technicians and laboratory assistants in such fields as environmental and space science. Working with the professional engineer or scientist, he may assist in performing intricate and detailed experiments; collect, organize and reduce technical data to manageable form for analysis; or perform investigations requiring mathematical and scientific backgrounds. Opportunities exist in the wide spectrum of research and development organizations which deal in the physical, mathematical, and engineering sciences.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
03.301, 03.302, 03.303	Calculus II, III, IV	6
10.321, 10.322, 10.323	Circuit Theory I, II, III	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
<b>Third Year</b>		
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
<b>Fourth Year</b>		
10.351, 10.352, 10.353	Advanced Mathematics I, II, III	6
11.331, 11.332, 11.333	Advanced Physics I, II, III	6
11.341, 11.342, 11.343	Physics Laboratory I, II, III	6
	Elective I, II, III	6
Total A.S. degree		99

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**Chemical-Biological Technology***Leading to the Degree of Bachelor of Science*

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related courses.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	} 6
	or	
10.307, 10.308	College Algebra & Trigonometry I, II	} 8
11.304, 11.305, 11.306	General Physics, I, II, III	
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

**Second Year**

10.316, 10.317, 10.318	Probability and Statistics I, II, III	} 6
	or	
10.320, 10.321, 10.322	Calculus I, II, III	} 8
18.311, 18.312, 18.313	Biology I, II, III	
23.501, 23.502, 23.503	Western Civilization I, II, III	12
		6

**Third Year**

12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III	6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III	9
19.501, 19.502, 19.503	Psychology I, II, III	6

**Fourth Year**

12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III	6
18.321, 18.322, 18.323	Microbiology I, II, III	12

**Fifth Year**

18.351, 18.352, 18.353	Histology-Organology I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
12.351, 12.352, 12.353	Instrumental and Radiochemistry I, II, III	6
16.531, 16.532, 16.533	Oceanography I, II and Marine Geology	6

**Sixth Year**

18.361, 18.362, 18.363	Ecology I, II, III	6
73.311, 73.312, 73.313	Clinical Biochemistry I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
	* Elective	6

\*General Science Teacher Option — Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.

**Seventh Year**

18.357, 18.358, 18.359	Genetics I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	* Elective	6
	* Elective	6

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 Total B.S. degree 174-178


## CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, air pollution control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer will work in close association with professionals in the field, and he may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology program graduates are with town, city, state, or federal public works departments and agencies; private consulting, engineering, architectural, and construction organizations; and with railroads and the military.

The Civil Engineering Technology related programs offered to the Lincoln College students are:

### *Associate in Engineering Degree*

Environmental Engineering Technology .....	page 76
Structural Engineering Technology .....	page 77
Surveying and Transportation Engineering Technology .....	page 78

### *Bachelor of Engineering Technology Degree*

Civil Engineering Technology .....	pages 79-80
Mechanical-Structural Engineering Technology .....	pages 81-82



**Environmental Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Municipal and Sanitary Engineering Technology prepares the graduate to assume responsibilities related to the design, construction, operation, and supervision of municipal plants and systems concerned with the storage and distribution of water and also the disposal of sewage and waste in urban areas with due consideration for contamination and pollution. Employment opportunities are with town, city and state public works departments, private engineering consultants, architects, contractors, and many other engineering organizations.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
<b>Third Year</b>		
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
12.307, 12.308, 12.309	* Modern Chemistry I, II, III	6
<b>Fourth Year</b>		
01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.351, 01.352, 01.353	Environmental Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
Total A.E. degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

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\*Students may elect to take 12.314, 12.315, 12.316 General Chemistry and Laboratory I, II, III (9 q.h.)



**Structural Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Structural Engineering Technology prepares the graduate to assume responsibilities related to the planning, design, and supervision of the construction of buildings, bridges, foundations; flood-control projects and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

**Second Year**

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

**Third Year**

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

**Fourth Year**

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6

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Total A.E. degree 96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

**Surveying and Transportation Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Surveying and Transportation Engineering Technology prepares the graduate to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects such as subdivision work, individual lot layouts, and highway layouts as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs, and aqueducts. Employment opportunities are with independent surveying companies; civil engineering companies; highway, transit and railroad planning groups as well as cartographers, construction companies and contractors.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
<b>Third Year</b>		
01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
<b>Fourth Year</b>		
01.307, 01.308, 01.309	Legal Aspects of Surveying I, II, III	6
01.311, 01.312, 01.313	Transportation Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
Total A.E. degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

**Civil Engineering Technology***Leading to the Degree of Bachelor of Engineering Technology*

The program in Civil Engineering Technology prepares the graduate to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design, and construction of all kinds of relatively permanent structures, municipal plants and systems, or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design, and supervision is open to graduates.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
01.301, 01.302, 01.303	Surveying I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2
<b>Third Year</b>		
01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	* Elective I, II, III	6
<b>Fourth Year</b>		
01.307, 01.308, 01.309	Legal Aspects of Survey I, II, III	6
01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
<b>Fifth Year</b>		
01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
12.307, 12.308, 12.309	† Modern Chemistry I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
<b>Sixth Year</b>		
01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	* Elective I, II, III	6

\*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

†Students may elect to take 12.314, 12.315, 12.316 Gen. Chem. and Laboratory I, II, III (9 q.h.)

**Seventh Year**

01.311, 01.312, 01.313	Transportation Engineering I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
	* Elective I, II, III	6

**Eighth Year**

01.351, 01.352, 01.353	Environmental Engineering I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	* Elective I, II, III	6

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Total B.E.T. degree 180

*Suggested Electives*

		Q.H.
01.327, 01.328, 01.329	Advanced Structural Analysis I, II, III	6
01.334, 01.335, 01.336	Advanced Structural Design I, II, III	6

Elective courses for which proper preparation exists may be chosen from within or outside of the Civil engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology programs desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (153 RI). Programs in Electrical and Civil Engineering are available on a part-time as well as a regular cooperative program. Mechanical, Industrial, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's office.

**Mechanical-Structural Engineering Technology***Leading to the Degree of Bachelor of Engineering Technology*

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc. and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content are integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

**Second Year**

09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

**Third Year**

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.314, 09.315, 09.316	Production Drawing and Design I, II, III	6
	* Elective I, II, III	6

**Fourth Year**

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

**Fifth Year**

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

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\*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the committee on Education.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

**Sixth Year**

01.331, 01.332, 01.333	Design of Structures I, II, III	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	* Elective I, II, III	6

**Seventh Year**

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
	* Elective I, II, III	6

**Eighth Year**

02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	* Elective I, II, III	6

Total B.E.T. degree	180
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*Suggested Technical Electives*

		Q.H.
02.337, 02.338, 02.339	Mechanical Vibrations I, II, III	6
01.327, 01.328, 01.329	Advanced Structural Analysis I, II, III	6

Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical — Structural engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (153 RI). Programs in Electrical and Civil Engineering are available on a part-time as well as a regular cooperative program. Mechanical, Industrial, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's office.

## ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to power, communications, data-processing, and electrical control. Its major functions are: 1) the generation, transmission and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar, and communication; 3) the design and construction of data-processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, in engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, in sales engineering, and in the electric utility industry.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

### *Associate in Engineering Degree*

Bioelectronic Engineering Technology . . . . .	page 58
Electrical Power Engineering Technology . . . . .	page 84
Computer Engineering Technology . . . . .	page 94
Electronics Engineering Technology . . . . .	page 85

### *Post-Associate Degree Certificate*

Control Systems Engineering Technology . . . . .	page 88
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### *Bachelor of Engineering Technology Degree*

Electrical Engineering Technology . . . . .	pages 86-87
(Accredited by Engineer's Council for Professional Development)	

The program in Electrical Engineering Technology leading to the Bachelor of Engineering Technology is also being offered as a day co-operative program beginning September, 1971.

For further information please call (617) 437-2200, or write.

The Dean of Admissions  
Northeastern University  
360 Huntington Avenue  
Boston, Massachusetts 02115

**Electrical Power Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Electric Power Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, operation, and maintenance of electrical machinery, power and control apparatus, and larger equipment employing heavy currents. The curriculum includes the study of the generation, transmission, and distribution of electrical energy for light and power, and the application and operation of electrical machinery in industry.

Employment opportunities are in public and investor-owned electrical utilities, electrical manufacturing companies, consulting engineering firms, control equipment design organizations, and communications companies.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
<b>Third Year</b>		
03.304, 03.305, 03.306	Circuit Theory IV, V, Electrical Measurements	6
11.320	Semiconductor Physics and Devices	4
03.311, 03.312	Electronics I, II	8
03.331, 03.332, 03.333	Energy Conversion I, II, III	6
<b>Fourth Year</b>		
03.334, 03.335, 03.336	Control Circuits I, II, III	6
03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
03.341, 03.342, 03.343	Power and Control Labs. I, II, III	6
Total A.E. degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.



**Electronics Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Electronic Engineering Technology prepares the graduate to assume responsibilities related to the design, development, and operation of communications, data-processing, and electronic control equipment for applications in computers, military and space explorations and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data-processing, and control equipment organizations, as well as other engineering oriented companies.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
<b>Third Year</b>		
03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements, Electronic Lab.	6
03.311, 03.312, 03.313	Electronics I, II, III	12
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
<b>Fourth Year</b>		
03.314, 03.315, 03.316	Pulse Circuits I, II, III	6
*03.317, 03.318, 03.319	Communications Engineering I, II, III	12
03.327, 03.328, 03.329	Advanced Electronic Lab. I, II, III	6
Total A. E. degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

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\*03.387, 03.388, 03.389 Active Integrated Circuits I, II, III  
plus

03.381, 03.382, 03.383 Transistor-Circuit Engineering I, II, III  
may be substituted for 03.317, 03.318, 03.319 Communications Engineering I, II, III.

**Electrical Engineering Technology**

(Accredited by — Engineers' Council for Professional Development)

*Leading to the Degree of Bachelor of Engineering Technology*

The program in Electrical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, operation, installation, and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data-processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, electric utilities, electrical, and electronic organizations concerned with operation and manufacture as well as installation and sales.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2
<b>Third Year</b>		
03.304, 03.305, 03.306	Circuit Theory IV, V, and Electrical Measurements	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
<b>Fourth Year</b>		
03.311, 03.312, 03.313	Electronics I, II, III	12
03.324, 03.325, 03.323	Circuits Laboratory I, II and Electronic Lab.	6
03.331, 03.332, 03.333	Energy Conversion I, II, III	6
<b>Fifth Year</b>		
03.317, 03.318, 03.319	Communication Engineering I, II, III	12
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

**Sixth Year**

03.327, 03.328, 03.329	Advanced Electronic Lab. I, II, III	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Computers I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
	* Elective I, II, III	6

**Seventh Year**

03.377, 03.378, 03.379	Control Systems I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	* Elective I, II, III	6

**Eighth Year**

30.604, 30.605	Introduction to Literary Forms, I, II	4
	English Elective	2
	* Elective I, II, III	6
	* Elective I, II, III	6
Total B.E.T. degree		180

*Suggested Technical Electives*

		Q.H.
03.314, 03.315, 03.316	Pulse Circuits I, II, III	6
03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
03.341, 03.342, 03.343	Power & Control Labs I, II, III	6
03.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6
03.367, 03.368, 03.369	Pulse & Digital Circuits I, II, III	6
03.374, 03.375, 03.376	Digital Systems I, II, III	6
03.381, 03.382, 03.383	Transistor Circuit Engineering I, II, III	6
03.384, 03.385, 03.386	Transmission Lines & Microwave Circuits I, II, III	6
03.387, 03.388, 03.389	Active Integrated Circuits I, II, III	6
09.354, 09.355, 09.356	Computer Systems I, II, III	6
09.357, 09.358, 09.359	Computer Aided Design I, II, III	6
09.361, 09.362, 09.363	Computer Controlled Systems I, II, III	6

Electrical Engineering Technology courses of elective nature may be chosen from the above list of courses.

Elective courses for which proper preparation exists may be chosen from within or outside of the electrical engineering discipline.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (153 RI). Programs in Electrical and Civil Engineering are available on a part-time as well as a regular cooperative program. Mechanical, Industrial, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's office.

\*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.

10.351, 10.352, 10.353 Advanced Mathematics I, II, III is recommended for all students planning advanced engineering technology subjects.

**Control Systems Engineering Technology***Leading to a Certificate*

The program in Control Systems Engineering Technology is designed to provide electrical and electronic background required in the development of control equipment and systems related to the age of automation. Practicing engineers who wish to avoid technological obsolescence may keep abreast of current control practices. The program presumes graduation from either Associate in Engineering degree programs in Electrical Power or Electronic Engineering Technology or Bachelor degree programs in a branch of engineering. A certificate will be awarded upon completion of 30 quarter hours of credit and have a minimum overall Q.P.A. requirement of 1.8 in Lincoln College.

*Required Courses*

Course Number	Course	Q.H.
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6

*Full Year Elective Sequences*

(Require completion of Transients in Linear Systems)

03.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6
03.367, 03.368, 03.369	Pulse and Digital Circuits I, II, III	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Computers I, II, III	6
03.374, 03.375, 03.376	Digital Systems I, II, III	6
03.377, 03.378, 03.379	Control Systems I, II, III	6
03.381, 03.382, 03.383	Transistor Circuit Engineering I, II, III	6
03.384, 03.385, 03.386	Transmission Lines and Microwave Circuits I, II, III	6
03.387, 03.388, 03.389	Active Integrated Circuits I, II, III	6

## MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers as well as heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design or development; 2) production, operation, testing or control and 3) installation, maintenance, and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically to function independently and in positions of managerial responsibility.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

### *Associate in Engineering Degree*

Mechanical Engineering Technology .....	page 90
Heat Engineering Technology .....	page 91

### *Bachelor of Engineering Technology Degree*

Mechanical Engineering Technology (Accredited by Engineers' Council for Professional Development) .....	pages 92-93
Mechanical-Structural Engineering Technology .....	pages 81-82

The program in Mechanical Engineering Technology leading to the Bachelor of Engineering Technology is also being offered as a day co-operative program beginning September, 1971.

For further information please call (617) 437-2200, or write.

The Dean of Admissions  
Northeastern University  
360 Huntington Avenue  
Boston, Massachusetts 02115

**Mechanical Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Mechanical Engineering Technology prepares the graduate to assume responsibilities related to the design, production and installation of mechanical tools, machinery, engines and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, and in light and heavy industries, as well as almost all engineering design organizations.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, II	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
<b>Third Year</b>		
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
*02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6
<b>Fourth Year</b>		
01.341, 01.342, 01.343	Fluid Mechanics I, II, II	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
Total A.E. Degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

\*03.320, 03.321, 03.322, Electricity and Electronics I, II, III, may be substituted for 02.341, 02.342, 02.343 Materials I, II, III.

**Heat Engineering Technology***Leading to the Degree of Associate in Engineering*

The program in Heat Engineering Technology prepares the graduate to assume responsibilities related to the design, operation, and construction of engines and equipment in which there are thermodynamic, hydraulic, and mechanical forces. Typical examples are automobile, aircraft, and ship engines; boilers and furnaces; as well as heating, air conditioning and ventilating devices. Employment opportunities are with architectural firms, engineering consultants, light and heavy mechanical industries, as well as other engineering oriented organizations.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, II	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
<b>Third Year</b>		
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6
<b>Fourth Year</b>		
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.354, 02.355, 02.356	Heat Transfer I, II, III	6
02.357, 02.358, 02.359	Heat Engineering I, II, III	6
02.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6
Total A.E. Degree		96

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, Bachelor of Engineering Technology, or Bachelor of Science degree.

**Mechanical Engineering Technology**

(Accredited by Engineers' Council for Professional Development)

*Leading to the Degree of Bachelor of Engineering Technology*

The program in Mechanical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, production operation and installation of all kinds of machinery, engines, transportation equipment as well as boilers, furnaces, and heating or air conditioning equipment, which involve interactions of mechanical, hydraulic and thermodynamic forces. Employment opportunities are in industrial producing mechanized and automated equipment, design and engineering organizations and in companies dealing primarily with manufacture and production.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

<b>First Year</b>		
Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
<b>Second Year</b>		
09.311, 09.312, 09.313	Engineering Graphics I, II, II	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2
<b>Third Year</b>		
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6
	* Elective I, II, III	6
<b>Fourth Year</b>		
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
<b>Fifth Year</b>		
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
12.381, 12.382, 12.383	Nuclear Technology I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

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\*Before registering for any electives, the student should submit a proposed program of elective courses — preferably representing a minor field of concentration consistent with his personal career objectives — for approval by the Committee on Education.  
10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.



**Sixth Year**

02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.354, 02.355, 02.356	Heat Transfer I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	* Elective I, II, III	6

**Seventh Year**

02.331, 02.332, 02.333	Mechanical Technology Lab. I, II, III	6
02.357, 02.358, 02.359	Heat Engineering I, II, III	6
	* Elective I, II, III	6

**Eighth Year**

02.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	* Elective I, II, III	6

Total B.E.T. degree	180
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*Suggested Technical Electives*

Q.H.

02.337, 02.338, 02.339	Mechanical Vibrations I, II, III	6
03.320, 03.321, 03.322	Electricity and Electronics I, II, III	6
02.334, 02.335, 02.336	Experimental Stress Analysis I, II, III	6
02.344, 02.345, 02.346	Applied Metallurgy I, II, III	6

\* Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical Engineer discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Department (153 RI). Programs in Electrical and Civil Engineering are available on a part-time as well as a regular cooperative program. Mechanical, Industrial, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's office.

**COMPUTER ENGINEERING TECHNOLOGY***Leading to the degree of Associate in Engineering*

The Computer Engineering Technology program is organized to provide the mathematical and technological background for understanding both the hardware and software aspects of computer systems. Graduates will be prepared as: a) programmers who translate engineering or scientific concepts into meaningful form for the computer; b) engineering technicians concerned with the development, specification production and operation of computer hardware; and c) applications technicians dealing with the interface of the computer with industrial process and control systems or data acquisition, reduction and display systems.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

**First Year**

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.328, 11.319	Physics I, II, III	12

**Second Year**

10.321, 10.322, 10.323	Calculus II, III, IV	6
08.301, 08.302, 08.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical & Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Princ. of Computer Programming I, II, III	6

**Third Year**

11.320	Semiconductor Physics & Devices and	4
03.311, 03.312	Electronics I, II	8
09.354, 09.355, 09.356	Computer Systems I, II, III	6
10.324, 10.325, 10.326	Differential Equation I, II, III	6

**Fourth Year**

03.323, 03.391, 03.092	Electronics Lab & Computer Technology Lab I, II	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Comps. I, II, III	6
	Any 2 of 4	
03.387, 03.388, 03.389	Active Integrated Circuits I, II, III	6
09.357, 09.358, 09.359	Computer Aided Design I, II, III	6
09.361, 09.362, 09.363	Computer Controlled Systems I, II, III	6
10.351, 10.352, 10.353	Advanced Mathematics I, II, III	6

# description of courses

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (ordinarily, one hour of class and two hours of preparation a week for a quarter of 12 weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

## Abbreviations

prereq. — Prerequisite  
coreq. — corequisite  
cl. — Class hours

lab. — Laboratory hours  
q.h. — Quarter hours

## Policy on Changes of Program

Lincoln College reserves the right to cancel, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

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## CIVIL ENGINEERING TECHNOLOGY

**01.301 Surveying I** (2 cl., 2 q.h.)

Surveying principles; theory of measurements; basic traverse computation.  
*Prereq.* 10.314 or 10.308.

**01.302 Surveying II** (2 cl., 2 q.h.)

Stadia principles and topography; simple, compound, and vertical curves. *Prereq.* 01.301.

**01.303 Surveying III** (2 cl., 2 q.h.)

Spiral easement curves, earthwork computations; solution of the mass diagram.  
*Prereq.* 01.302.

**01.304 Advanced Surveying I** (1 cl., 2 lab., 2 q.h.)

Introduction to observations for latitude, time azimuth including basic spherical trigonometry. *Prereq.* 01.303.

**01.305 Advanced Surveying II** (1 cl., 2 lab., 2 q.h.)

Precise leveling, triangulation and base line measurements. Use of the geodimeter and telurometer. *Prereq.* 01.304.

**01.306 Advanced Surveying III** (1 cl., 2 lab., 2 q.h.)

Basic principles of photogrammetry and map making from aerial photographs. Map projections. *Prereq.* 01.305.

**01.307 Legal Aspects of Surveying I** (2 cl., 2 q.h.)

Surveyor as an expert witness with emphasis on his knowledge of measurements; easements. Registry of Deeds procedure and how land is sold. *Prereq.* 01.303.

**01.308 Legal Aspects of Surveying II** (2 cl., 2 q.h.)

Deeds and their essential elements, descriptions, and water rights. *Prereq.* 01.307.

**01.309 Legal Aspects of Surveying III** (2 cl., 2 q.h.)

Land court procedure and the subdivision control law. *Prereq.* 01.308.

**01.311 Transportation Engineering I** (2 cl., 2 q.h.)

Engineering considerations in the planning and construction of modern highways and highway routing. *Prereq.* 01.301.

**01.312 Transportation Engineering II** (2 cl., 2 q.h.)

Rates of grade, superelevation, flexible and rigid pavements, and other features of highway design. *Prereq.* 01.311.

**01.313 Transportation Engineering III** (2 cl., 2 q.h.)

Traffic flow and traffic control. Computer applications to transportation problems. *Prereq.* 01.312.

**01.321 Introduction to Structures I** (1 cl., 2 lab., 2 q.h.)

Framing plans and details for steel structures. *Prereq.* 09.313 and 02.303.

**01.322 Introduction to Structures II** (1 cl., 2 lab., 2 q.h.)

Structural shop drafting and the evaluation of load capacities of rivets, welds, and bolts for structural connections using the AISC code. *Prereq.* 01.321.

**01.323 Introduction to Structures III** (1 cl., 2 lab., 2 q.h.)

Design and detailing of joints including standard connections, seats, and brackets. *Prereq.* 01.322.

**01.324 Structural Analysis I** (2 cl., 2 q.h.)

Reactions, shears, bending moments, and forces developed by loads on beams and trusses. Analytical and graphical methods. *Prereq.* 02.323.

**01.325 Structural Analysis II** (2 cl., 2 q.h.)

Influence lines for beams, girders, and trusses. Solutions for forces from moving load systems on statically determinate structures. *Prereq.* 01.324.

**01.326 Structural Analysis III** (2 cl., 2 q.h.)

Introduction to classical methods of deflection solutions of beams and trusses. Methods of solving statically indeterminate structures. *Prereq.* 01.325.

**01.327 Advanced Structural Analysis I (2 cl., 2 q.h.)**

Analysis of indeterminacy and instability. Analysis of statically indeterminate structures using Castigliano, Virtual Work, method of deflections, and the neutral point methods. *Prereq.* 01.326.

**01.328 Advanced Structural Analysis II (2 cl., 2 q.h.)**

Analysis of statically indeterminate structures using the column analogy, moment, area, elastic weights, and conjugate structures. *Prereq.* 01.327.

**01.329 Advanced Structural Analysis III (2 cl., 2 q.h.)**

Analysis of statically indeterminate structures using Williot-Mohr, slope deflection, and moment distribution. *Prereq.* 01.328.

**01.331 Design of Structures I (2 cl., 2 q.h.)**

Design of steel members in structural frames. Tension, compression, bending, and eccentrically loaded members. *Prereq.* 01.323 and 02.323.

**01.332 Design of Structures II (2 cl., 2 q.h.)**

Design of plate girders, highway bridge decks, and roof framing systems. *Prereq.* 01.331.

**01.333 Design of Structures III (2 cl., 2 q.h.)**

Composite design in bridges and buildings. Introduction to plastic design methods in steel. *Prereq.* 01.332.

**01.334 Advanced Structural Design I (2 cl., 2 q.h.)**

Design of continuous frames in structural steel, moment resistant connections, and column bases. *Prereq.* 01.326, 01.333, 01.373.

**01.335 Advanced Structural Design II (2 cl., 2 q.h.)**

Design of continuous frames in reinforced concrete. Introduction to prestressed concrete member design. *Prereq.* 01.334.

**01.336 Advanced Structural Design III (2 cl., 2 q.h.)**

Design of foundations for structures. Spread footings, combined footings, mats and pile foundations. *Prereq.* 01.335.

**01.341 Fluid Mechanics I (2 cl., 2 q.h.)**

Hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. *Prereq.* 02.303.

**01.342 Fluid Mechanics II (2 cl., 2 q.h.)**

Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq.* 01.341.

**01.343 Fluid Mechanics III (2 cl., 2 q.h.)**

Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; non-uniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq.* 01.342.

**01.351 Environmental Engineering** (2 cl., 2 q.h.)

Principles of water supply engineering; population forecasting, quality and quantity of water for various uses. Water-treatment processes. *Prereq.* 01.343 and 12.313 or 12.309.

**01.352 Environmental Engineering II** (2 cl., 2 q.h.)

Collection and disposal of sewage and storm water. Modern methods of treatment and sewage-plant operation. *Prereq.* 01.351.

**01.353 Environmental Engineering III** (1 cl., 2 lab., 2 q.h.)

Layout and design of water-treatment and sewage treatment plants. Instrumentation and electrical equipment. *Prereq.* 01.352.

**01.361 Materials and Soil Mechanics I**

Physical properties of Portland cement, aggregates, mixing water, and admixtures. Proportioning of batches. Mixing, placing, and finishing of concrete. Bituminous materials. *Prereq.* 02.303.

**01.362 Materials and Soil Mechanics II**

Index properties, soil moisture, and structure. Compressibility, theory of consolidation. *Prereq.* 01.361.

**01.363 Materials and Soil Mechanics III**

Shearing strength of soils, stress analysis, settlement calculations. Lateral earth pressures, bearing capacity of shallow footings. Soil compaction, stabilization and site investigation. *Prereq.* 01.362.

**01.371 Reinforced-Concrete Design I** (2 cl., 2 q.h.)

Design of bending members in reinforced concrete, using elastic and ultimate-strength theories. *Prereq.* 02.323.

**01.372 Reinforced-Concrete Design II** (2 cl., 2 q.h.)

Design of axially and eccentrically loaded columns by elastic and ultimate strength principles. *Prereq.* 01.371.

**01.373 Reinforced-Concrete Design III** (2 cl., 2 q.h.)

Reinforced-concrete design of basic structures including consideration of continuity. *Prereq.* 01.372.

## MECHANICAL ENGINEERING TECHNOLOGY

**02.301 Mechanics (Statics) I** (2 cl., 2 q.h.)

Forces, moments, couples, statics of particles, and rigid bodies in two and three dimensions. *Prereq.* 10.320 and 11.317.

**02.302 Mechanics (Statics) II** (2 cl., 2 q.h.)

Distributed forces — external and internal. First moments and centroids. Analysis of structures — trusses, frames, and machines. *Prereq.* 2.301.

**02.303 Mechanics (Statics) III** (2 cl., 2 q.h.)

Friction, second moments, and virtual work. *Prereq.* 02.302.

**02.304 Mechanics (Dynamics) I** (2 cl., 2 q.h.)

Kinematics of particles — rectilinear and curvilinear motion of dynamic particles — force, mass and acceleration, work and energy. *Prereq.* 02.303.

**02.305 Mechanics (Dynamics) II** (2 cl., 2 q.h.)

Impulse and momentum of particles. Kinematics and dynamics of rigid bodies — force mass and acceleration. *Prereq.* 02.304.

**02.306 Mechanics (Dynamics) III** (2 cl., 2 q.h.)

Dynamics of rigid bodies — work and energy, impulse and momentum. Introduction to mechanical vibration. *Prereq.* 02.305.

**02.321 Stress Analysis I** (2 cl., 2 q.h.)

Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres. Riveted and welded joints. *Prereq.* 02.303.

**02.322 Stress Analysis II** (2 cl., 2 q.h.)

Shear and bending moment in beams; stresses in beams; design of beams; curvature of beams. *Prereq.* 02.321.

**02.323 Stress Analysis III** (2 cl., 2 q.h.)

Determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. *Prereq.* 02.322.

**02.324 Advanced Stress Analysis I** (2 cl., 2 q.h.)

Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses, principal stresses, Mohr's circle; theories of failure. *Prereq.* 02.323.

**02.325 Advanced Stress Analysis II** (2 cl., 2 q.h.)

Curved beams; non-symmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. *Prereq.* 02.324.

**02.326 Advanced Stress Analysis III** (2 cl., 2 q.h.)

Columns; energy absorption and resilience; inertial stresses impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq.* 02.325.

**02.327 Mechanical Design I** (2 cl., 2 q.h.)

Failure criteria; properties and selection of materials; manufacturing considerations; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq.* 02.306, 02.323.

**02.328 Mechanical Design II** (2 cl., 2 q.h.)

Stresses, deformation and design of springs; screws, keys, pins and interference fits; preloading of bolted joints; shafts and flywheels, friction brakes. *Prereq.* 02.327.

**02.329 Mechanical Design III** (2 cl., 2 q.h.)

Lubrication and journal bearings; anti-friction bearings; stresses and power transmission of spur, bevel and worm gear; screws for power transmission. *Prereq.* 02.328.



**02.331 Mechanical Technology Laboratory I** (3 lab., 2 q.h.)

Experiments concerning the physical properties of materials. Instrumentation and measurement. *Prereq.* 02.343, 02.324 or concurrently.

**02.332 Mechanical Technology Laboratory II** (3 lab., 2 q.h.)

Experiments concerning compressible and incompressible fluids. Experimental techniques. *Prereq.* 02.331, 01.341.

**02.333 Mechanical Technology Laboratory III** (3 lab., 2 q.h.)

Experiments of a more advanced nature. Introduction to the analog computer and experimental stress analysis. *Prereq.* 02.332, 02.325.

**02.334 Experimental Stress Analysis I** (2 cl., 2 q.h.)

Theory and experimentation showing the application of extensometers and electrical strain gages as transducers and in the field of experimental stress and strain analysis. *Prereq.* 02.324.

**02.335 Experimental Stress Analysis II** (2 cl., 2 q.h.)

Theory and laboratory practice of photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq.* 02.334.

**02.336 Experimental Stress Analysis III** (2 cl., 2 q.h.)

The use of resinous and ceramic brittle coatings in experimental analysis; Moiré method of strain analysis; statistical treatment of experimental data. *Prereq.* 02.335.

**02.337 Mechanical Vibrations I** (2 cl., 2 q.h.)

Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods.) Natural frequencies. Damped free and forced vibration. Impedance and mobility. *Prereq.* 02.306.

**02.338 Mechanical Vibrations II** (2 cl., 2 q.h.)

Systems with more than one degree of freedom. Influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq.* 02.337.

**02.339 Mechanical Vibrations III** (2 cl., 2 q.h.)

Natural frequencies by Rayleigh methods and Holzer methods for multi-degree of freedom. Application problems with combined rotation and translation. Laplace transforms and electro-mechanical analogs. *Prereq.* 02.338.

**02.341 Materials I** (2 cl., 2 q.h.)

Lectures on: fundamental material structures, general information covering theoretical aspects of properties, testing and failure of materials supplemented by visual aids. *Prereq.* none.

**02.342 Materials II** (2 cl., 2 q.h.)

Lectures on: alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering materials, principles of material fabrication. *Prereq.* 02.341.

**02.343 Materials III** (2 cl., 2 q.h.)

Lectures on: Inorganic materials, i.e., polymers, glasses, ceramics, cements, wood; and materials having important electrical and magnetic properties, also a summary of the most up-to-date applications for the fabrication and uses of both metals and non-metals. *Prereq.* 02.342.

**02.344 Applied Metallurgy I** (1 cl., 1 lab., 2 q.h.)

Lectures: Structures of metals, imperfections, phase diagrams, effect of temperature on structure and properties of metals, (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms, mechanical properties of non-ferrous metals.

Laboratory: Experiments in preparation of samples, selection, polishing and etching, examination of non-ferrous metals, use of the microscope, linear analysis, construction of cooling curves, and simple binary phase diagrams. *Prereq.* 02.342.

**02.345 Applied Metallurgy II** (1 cl., 1 lab., 2 q.h.)

Lectures: Mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals.

Laboratory: Experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. *Prereq.* 02.344.

**02.346 Applied Metallurgy III** (1 cl., 1 lab., 2 q.h.)

Lectures: Manufacturing processes, methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

Laboratory: Experiments in cold rolling, swagging, drawing of non-ferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq.* 02.345.

**02.351 Thermodynamics I** (2 cl., 2 q.h.)

General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. *Prereq.* 11.318.

**02.352 Thermodynamics II** (2 cl., 2 q.h.)

Properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor power cycles. *Prereq.* 02.351.

**02.353 Thermodynamics III** (2 cl., 2 q.h.)

Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. *Prereq.* 02.352.

**02.354 Heat Transfer I** (2 cl., 2 q.h.)

The primary modes of heat transfer; thermal conductance/resistance concept; thermal-electrical analogy; combined heat transfer mechanisms; basic equations of conduction; thermal conductivity; analytical solutions of various steady state conduction problems. *Prereq.* 02.353.

**02.355 Heat Transfer II** (2 cl., 2 q.h.)

Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; log-mean temperature differences; overall heat transfer coefficients; applications to heat exchangers. *Prereq.* 02.354.

**02.356 Heat Transfer III (2 cl., 2 q.h.)**

Black body radiation; Kirchoff's Law; emissivity and absorptivity; radiation between simple bodies. Graphical and numerical methods applied to steady state, conduction problems; radiation and convection effects; transient heat transfer; numerical methods applied to transient problems; heat transfer engineering problems. *Prereq.* 02.355.

**02.357 Heat Engineering I (Refrigeration) (2 cl., 2 q.h.)**

Principles of gas compression, analysis of vapor compression, refrigeration systems, low temperature refrigeration cycles, and absorption refrigeration systems. *Prereq.* 02.353.

**02.358 Heat Engineering II (Air Conditioning) (2 cl., 2 q.h.)**

Air conditioning principles including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. *Prereq.* 02.353.

**02.359 Heat Engineering III (Turbines) (2 cl., 2 q.h.)**

Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance, fan performance. *Prereq.* 02.353.

**02.361 Heat Technology Laboratory I (3 lab., 2 q.h.)**

Experiments illustrating principles thermodynamics and heat transfer. Instrumentation and measurement. *Prereq.* 02.353.

**02.362 Heat Technology Laboratory II (3 lab., 2 q.h.)**

Experiments on various types of heat engines. Experimental techniques. *Prereq.* 02.361, 02.354 and 02.357.

**02.363 Heat Technology Laboratory III (3 lab., 2 q.h.)**

Experiments of a more advanced nature further illustrating the principles of thermodynamics and making use of the student's increased theoretical background. Simulation of heat problems on analog computer. *Prereq.* 02.362.

## ELECTRICAL ENGINEERING TECHNOLOGY

**03.301 Circuit Theory I (2 cl., 2 q.h.)**

Ohm's law, Kirchoff's current and voltage laws, equivalent resistances and sources, mesh and nodal analysis, network theorems, two-port networks and power relations all with respect to direct currents. *Prereq.* 10.320 and 11.319.

**03.302 Circuit Theory II (2 cl., 2 q.h.)**

Energy storage, singularity functions, response of R, L and C elements to singularities. *Prereq.* 03.301, 10.322 Concurrently.

**03.303 Circuit Theory III (2 cl., 2 q.h.)**

Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits. *Prereq.* 03.302.

**03.304 Circuit Theory IV (2 cl., 2 q.h.)**

Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq.* 03.303.

**03.305 Circuit Theory V** (2 cl., 2 q.h.)

Consideration of balanced and unbalanced polyphase power circuits; symmetrical components, harmonic analysis. *Prereq.* 03.304.

**03.306 Electrical Measurements** (2 cl., 2 q.h.)

Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, etc. Direct and substitution measurements. Evaluation of measured data — standard deviation and tolerance limits, instruments calibrations — effect of residual impedance. *Prereq.* 03.304.

**03.307 Electrical-Electronic Principles I** (2 cl., 2 q.h.)

Direct-current circuit principles. Principles of magnetism and inductance. Alternating-current circuits. Inductive and capacitive reactance. *Prereq.* 10.503, 11.306.

**03.308 Electrical-Electronic Principles II** (2 cl., 2 q.h.)

Series and parallel resonance; filters; electron emission. Vacuum-tubes and vacuum-tube circuits. Semiconductor junctions. Transistors and diodes. Application of tubes and transistors. Power supplies, measuring devices, meters. *Prereq.* 03.307.

**03.309 Electrical-Electronic Principles III** (2 cl., 2 q.h.)

Oscillators and amplifiers; modulation; transmitters. *Prereq.* 03.308.

**03.311 Electronics I** (4 cl., 4 q.h.)

Vacuum, semiconductor diodes, vacuum tubes and transistors as amplifying devices. Graphical analysis of basic amplifiers d-c and a-c loadlines. Transistor biasing techniques. Small signal low-frequency transistor models. *Prereq.* 03.303, 11.323, or 11.320.

**03.312 Electronics II** (4 cl., 4 q.h.)

A-c equivalent circuits, low-frequency amplifier circuits. Frequency effects in audio amplifiers. High-frequency transistor model. Power supplies and filters, voltage regulation. *Prereq.* 03.311.

**03.313 Electronics III** (4 cl., 4 q.h.)

Continuation of transistor circuits. Untuned voltage amplifiers, feedback amplifiers and oscillators, low-frequency large signal amplifiers. Field effect transistor circuits. *Prereq.* 03.312.

**03.314 Pulse Circuits I** (2 cl., 2 q.h.)

Study of wave shaping circuitry including clippers, clampers, slicers. Study of wideband amplifiers including compensation, rise time and sag. Review of semiconductor diodes. Study of the use of the transistor as a switch. *Prereq.* 03.313.

**03.315 Pulse Circuits II** (2 cl., 2 q.h.)

Design of multivibrator ckts; bistable, astable and monostable. Study of counting and timing ckts. Synchronization, voltage time-base generators, Miller integrator, bootstrap ckt, etc. *Prereq.* 03.314.

**03.316 Pulse Circuits III** (2 cl., 2 q.h.)

Familiarization with binary notation and Boolean Algebra. Analysis of some integrated OR, AND, NOT, NAND, and NOR circuits. Study of details of shift register and diode matrix. Fundamentals of multivibrators. *Prereq.* 03.315.

**03.317 Communication Engineering I** (4 cl., 4 q.h.)

Review of linear circuits. Analysis of transistor "black-box" equivalent circuits. Noise in electrical devices. Discussion of Fourier Analysis. Study of single-tuned amplifiers. *Prereq.* 03.313.

**03.318 Communication Engineering II** (4 cl., 4 q.h.)

Analysis of stagger-tuned and double-tuned circuitry. Outline for class A, B, and C linear power amplifiers. Phase inverters and drive circuitry. Basic theory of oscillators including RLC, RC and crystal. Block diagrams of amplitude and frequency modulated systems. *Prereq.* 03.317.

**03.319 Communication Engineering III** (4 cl., 4 q.h.)

Theory of amplitude and frequency modulation. Study of various signal detection systems. Noise susceptibility of systems. Introduction to data transmission systems. *Prereq.* 03.318.

**03.320 Electricity and Electronics I** (2 cl., 2 q.h.)

Introduction to circuit analysis, resistive networks, periodic excitation function, steady-state a-c circuits. *Prereq.* 11.319.

**03.321 Electricity and Electronics II** (2 cl., 2 q.h.)

The physical foundation of electronics, physical operation of electronic devices, single-stage electronic circuits. *Prereq.* 03.320.

**03.322 Electricity and Electronics III** (2 cl., 2 q.h.)

Magnetic circuits and transformers, electromechanical energy conversion d-c machines, a-c machines. *Prereq.* 03.321.

**03.323 Electronic Laboratory** (3 lab., 2 q.h.)

Experiments dealing with laboratory equipment techniques, transistor and crystal-diode characteristics, the impedance bridge, the Q-Meter, coils with iron cores, filter circuits, vacuum and semi-conductor diodes, power supplies including the regulated type, triode and pentode vacuum tubes, silicon controlled rectifiers, resistance-coupled amplifiers using transistors. *Prereq.* 03.312.

**03.324 Circuits Laboratory I** (3 lab., 2 q.h.)

Experimentation in electronic circuit theory. Instrumentation verification of circuit theorems; linear devices. *Prereq.* 03.306.

**03.325 Circuits Laboratory II** (3 lab., 2 q.h.)

Further experimentation in electrical circuits, including non-linear devices. Response to impulses; network parameters and synthesis; terminal characteristics of active devices. *Prereq.* 03.324.

**03.327 Advanced Electronic Laboratory I** (3 lab., 2 q.h.)

Experiments dealing with oscilloscopes, transistor amplifiers with negative feedback, directly coupled and difference amplifiers, class B audio amplifier with transistors, push-pull amplifiers, drivers and distortion measurements. Double-tuned transformers, video amplifiers, audio frequency oscillators, clipping and clamping circuits, transients and square-wave testing of audio amplifiers. *Prereq.* 03.323 and 03.313.

**03.328 Advanced Electronic Laboratory II** (3 lab., 2 q.h.)

Experiments dealing with operational amplifiers. Modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, networks in FM and television equipment, pulse and counter circuits and frequency dividers, sawtooth generators, astable (free-running) multivibrators, logic gates, frequency modulation detectors, analog computers. *Prereq.* 03.327.

**03.329 Advanced Electronic Laboratory III** (3 lab., 2 q.h.)

Spectral studies of FM and PM waves, amplitude limiters. The balanced modulators and single sideband generators. Binary adders, registers and counters, testing of a radio receiver, television receiver demonstrator. Pulse forming and delay lines, slotted lines and a series of five microwave experiments. *Prereq.* 03.328.

**03.331 Energy Conversion I** (2 cl., 2 q.h.)

Generalized theory of electromechanical energy conversion. Two-winding transformer; general torque form applied to singly and doubly-excited rotating devices. *Prereq.* 03.303 and 10.323.

**03.332 Energy Conversion II** (2 cl., 2 q.h.)

Induction and synchronous machines. *Prereq.* 03.331.

**03.333 Energy Conversion III** (2 cl., 2 q.h.)

Generalized machine and circuit model; d-c machine; transfer functions and flow chart analysis. Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq.* 03.332.

**03.334 Control Circuits I** (2 cl., 2 q.h.)

Basic control design considerations; circuit transfer functions, time and frequency response relationships, bode diagrams. General feedback applications; stability and compensating techniques as related to more complex control systems. *Prereq.* 03.312 and 03.333.

**03.335 Control Circuits II** (2 cl., 2 q.h.)

Characteristics and construction of common control circuit devices; synchros, choppers, magnetic amplifiers, SCR's, control motors, gear trains, tachometers. *Prereq.* 03.334.

**03.336 Control Circuits III** (2 cl., 2 q.h.)

System open and closed loop transfer functions; stability, speed of response, and accuracy trade-offs. Industrial uses including speed and voltage regulation, photoelectric, timing, sorting, and temperature control applications. *Prereq.* 03.335.

**03.337 Basic Power Systems I** (4 cl., 4 q.h.)

Consideration of power transmission lines; line constants; current, voltage, and power relations; introduction to electric-power distribution loads, feeders, and substations; voltage regulation theory and applications. *Prereq.* 03.333.

**03.338 Basic Power Systems II** (4 cl., 4 q.h.)

Consideration of symmetrical and unsymmetrical faults; protective devices — application and coordination; power flow in electric circuits; steady-state power limitations of systems; stability criteria. *Prereq.* 03.337.

**03.339 Basic Power Systems III** (4 cl., 4 q.h.)

Computer applications to power systems with emphasis on load-flow studies and basic ideas of system planning. *Prereq.* 03.338.



**03.341 Power and Controls Laboratory I** (4 lab., 2 q.h.)

Experimentation on measurement techniques, basic devices and circuits (including power circuits), transformers. *Prereq.* 03.333 and 03.334 or concurrently.

**03.342 Power and Controls Laboratory II** (4 lab., 2 q.h.)

Experimentation on the steady-state and dynamic characteristics of rotating machines. *Prereq.* 03.341.

**03.343 Power and Controls Laboratory III** (4 lab., 2 q.h.)

Experimentation on control devices, systems including servomechanisms, voltage and speed control systems, power rectifiers. *Prereq.* 03.342.

**03.351 Bioelectronic Devices I** (2 cl., 2 q.h.)

Transducers, relating body functions and biomedical reactions to electronic signals. Optics and optical components including mirror lenses, prisms, and gratings. Diffraction and refraction of light into spectral components and spectra. *Prereq.* 03.312. (offered alternate years)

**03.352 Bioelectronic Devices II** (2 cl., 2 q.h.)

Operational amplifier design and utilization, special power supply design. Chromatography and design of chromatography systems. Spectrophotometry radiation counting equipment and Ph measurement equipment related to chromatography. The electrocardiograph, electroencephalograph, and related physiological equipment will be discussed. *Prereq.* 03.351. (offered alternate years)

**03.353 Bioelectronic Devices III** (2 cl., 2 q.h.)

Blood pressure and flow measurement including ultrasonic devices, centrifugation, and ultracentrifugation equipment as well as amino acid analyzers. Nerve-conduction apparatus and techniques. Professional specialists in the field will lecture on special topics. *Prereq.* 03.352. (offered alternate years)

**03.357 Bioelectronic Laboratory I** (3 lab., 2 q.h.)

Experiments in electronic circuitry including audio amplifiers, differential amplifiers, power amplifiers, oscillators, and related circuits. Experiments in optics covering lenses, mirrors, prisms, gratings, and spectra. Radiation experiments. *Prereq.* 03.312. (offered alternate years)

**03.358 Bioelectronic Laboratory II** (3 lab., 2 q.h.)

Special design experiments on the optical bench related to spectrophotometry, experiments with optical and electrooptical system. Design of detection and amplification, monitoring systems. *Prereq.* 03.357. (offered alternate years)

**03.359 Bioelectronic Laboratory III** (3 lab., 2 q.h.)

Experiments and open discussion centered around bioelectronic systems including electrocardiogram, electroencephalograph, amino and acid analyzers, Ph measurement and titration apparatus, centrifuges, and ultracentrifuges as well as radioactive sample changers. *Prereq.* 03.358. (offered alternate years)

**03.361 Transients in Linear Systems I** (2 cl., 2 q.h.)

Application of differential equations to the solutions of linear, time-invariant electrical networks. Introduction to singularity functions, convolution, and time domain transient analysis. *Prereq.* 10.324 or concurrently, 03.304 or equivalent.

**03.362 Transients in Linear Systems II** (2 cl. 2 q.h.)

Network topology and duality, introduction to the methods of transformation calculus and complex frequency concepts. Signal analysis in the frequency domain. Fourier series, Fourier and Laplace transform methods. *Prereq.* 10.325 or concurrently, 03.361.

**03.363 Transients in Linear Systems III** (2 cl., 2 q.h.)

A varied selection of circuit problems are solved using Laplace transforms, and related theorems. *Prereq.* 03.362.

**03.364 Advanced Circuit Theory I** (2 cl., 2 q.h.)

Definition and tests for lumped, linear, time-invariant systems. General analysis of networks by loop current and node voltage variables. *Prereq.* 03.363.

**03.365 Advanced Circuit Theory II** (2 cl., 2 q.h.)

A study of two terminal pair networks using various parameter systems. S-plane analysis of system response. *Prereq.* 03.364.

**03.366 Advanced Circuit Theory III** (2 cl., 2 q.h.)

Discussion of the necessary and sufficient conditions for the physical realizing of impedance functions; Foster and Cauer forms. *Prereq.* 03.365.

**03.367 Pulse and Digital Circuits I** (2 cl., 2 q.h.)

Linear and non-linear pulse forming and processing techniques. Design of gate and binary circuits for operation under severe environmental conditions. *Prereq.* 03.363.

**03.368 Pulse and Digital Circuits II** (2 cl., 2 q.h.)

Analysis of applications of existing integrated circuits. *Prereq.* 03.367.

**03.369 Pulse and Digital Circuits III** (2 cl., 2 q.h.)

Negative-impedance devices and their applications. Linear voltage and current sweep circuits. *Prereq.* 03.368.

**03.371 Analog, Digital and Hybrid Computers I** (2 cl. 2 q.h.)

Theory and operation of analog computers. Amplitude scaling and time scaling on the analog computer and application of the analog computer to the solution of linear and non-linear differential equations. *Prereq.* 10.325.

**03.372 Analog, Digital and Hybrid Computers II** (2 cl., 2 q.h.)

Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design. *Prereq.* 03.371.

**03.373 Analog, Digital and Hybrid Computers III** (2 cl., 2 q.h.)

Survey of the present state-of-the-art hybrid computers. Problem areas unique to hybrid computers such as interface, analog-to-digital and digital-to-analog conversion will also be discussed. Hybrid computer programming techniques. Direct digital process control computers. *Prereq.* 03.372.

**03.374 Digital Systems I** (2 cl., 2 q.h.)

Basic concepts of Boolean Algebra. Switching components. Analysis and synthesis of combinational circuits. Analysis and synthesis of sequential circuits. Examples of application. *Prereq.* 03.316.



**03.375 Digital Systems II (2 cl., 2 q.h.)**

Data acquisition techniques. Data decommutation techniques relative to communications systems. Aerospace telemetry systems. Analog and digital data reduction. Real time data processing. *Prereq.* 03.374, 03.319.

**03.376 Digital Systems III (2 cl., 2 q.h.)**

Residue number systems. Threshold logic concepts. Advanced digital system techniques with applications to complex systems. *Prereq.* 03.375.

**03.377 Control Systems I (2 cl., 2 q.h.)**

Analysis of linear servomechanisms under both transient and steady-state conditions. Signal flow graphs. *Prereq.* 03.363.

**03.378 Control Systems II (2 cl., 2 q.h.)**

Laplace transforms used in the formulation of block diagrams and transfer functions. System stability. Root locus techniques. *Prereq.* 03.377.

**03.379 Control Systems III (2 cl., 2 q.h.)**

Treatment of Nyquist criteria, and Bode diagram methods for systems evaluation. *Prereq.* 03.378.

**03.381 Transistor-Circuit Engineering I (2 cl., 2 q.h.)**

Introduction to semiconductor physics. Field effect transistors included. Large and small signal analysis. Biasing. *Prereq.* 03.363.

**03.382 Transistor-Circuit Engineering II (2 cl., 2 q.h.)**

Low-frequency amplifier design including R-C and transformer coupling; video amplifiers; tuned and feedback amplifiers. *Prereq.* 03.381.

**03.383 Transistor-Circuit Engineering III (2 cl., 2 q.h.)**

Feedback amplifiers; power amplifiers; low-noise amplifiers and integrated circuits. *Prereq.* 03.382.

**03.384 Microwave Semiconductor Devices and Circuits I (2 cl., 2 q.h.)**

Provides basic understanding of the principles and design techniques for microwave circuits utilizing semiconductor devices. Introduction to microwave theory and techniques. Development of the Smith Chart for the graphical solution of microwave problems. *Prereq.* 03.304.

**03.385 Microwave Semiconductor Devices and Circuits II (2 cl., 2 q.h.)**

Introduction to the basic properties of semiconductors at microwave frequencies including analysis of bulk semiconductor effects and of junction phenomena. The course will analyze the physical properties and microwave characteristics of avalanche diodes, varactor diodes, tunnel diodes, PIN diodes, Gunn effect devices, and the microwave transistors. *Prereq.* 03.384.

**03.386 Microwave Semiconductor Devices and Circuits III (2 cl., 2 q.h.)**

Design and utilization of semiconductor devices in microwave circuits for microwave generation, amplification, frequency conversion, multiplication, and detection. Introduction to the miniaturization of microwave circuits and the integration of microwave functions. The characteristics and limitation of the devices. *Prereq.* 03.385.

**03.387 Active Integrated Circuits I — Solid State Devices (2 cl., 2 q.h.)**

Review of semiconductor physics and important transistor parameters. Integrated circuit technology. Exotic devices consisting of zener diode, SCR, unijunction transistor, FET. *Prereq.* 03.313.

**03.388 Active Integrated Circuits II — Digital Integrated Circuits**

(2 cl., 2 q.h.)

Review of Boolean algebra, logic circuits and truth tables. Types of integrated logic: RTL, DTL, and TTL. Integrated logic specifications registers, counters, and frequency dividers. Adders and subtracters. *Prereq.* 03.387.

**03.389 Active Integrated Circuits III — Linear Integrated Circuits**

(2 cl., 2 q.h.)

The operational amplifier, feedback theory and stability criteria. Operational amplifier parameters: loop gain, impedance, common mode rejection, offset voltage and current, temp. coefficient, slewing rate, input noise voltage. Inverting, noninverting, and differential configurations. Circuit applications: oscillator, integrator, phase detector; RD/A A/D converters, BCD conversion; memories. *Prereq.* 03.388.

**03.391 Computer Technology Laboratory II (3 lab., 2 q.h.)**

Oscilloscope techniques, series and shunt feedback in transistor amplifiers, operational amplifiers, video amplifiers, transients, clipping and clamping circuits, basic timing circuits, logic gates, astable (free running) multivibrators, pulse and counter circuits and frequency dividers, a study of an analog computer. *Prereq.* 03.323.

**03.392 Computer Technology Laboratory III (3 lab., 2 q.h.)**

The binary concept, basic logic gates, flip flops, Boolean Algebra to gating networks, binary counters, serial addition, parallel addition, binary coded decimal operations, code conversion and decoding, systems considerations. *Prereq.* 03.391.

**03.394 Electrical — Electronic Principles A (3 cl., 3 q.h.)**

Laws of voltage, current, and power. Series and parallel circuits. Principles of magnetism, and electro-magnetic induction. Alternating current, voltage, and power relationships. Principles of capacitive and inductive reactance. *Prereq.* 10.503, 11.306.

**03.395 Electrical — Electronic Principles B (3 cl., 3 q.h.)**

Series parallel ac circuits including resonance. Transformer, motor, and generator principles. Transformer, motor and generator principles. Meters, vacuum tubes, semi-conductor diodes, and transistors. Principles of filters. *Prereq.* 03.307.

**03.396 Basic Optics for Instrumentation (2 cl., 2 q.h.)**

Provides the necessary background for the two instrumentation courses listed below. Includes basic topics in geometrical and physical optics. No previous background in optics is assumed. Topics included are: Gaussian optics; fundamental laws of image formation; basic elements of optical design; Scalar wave theory; interference and diffraction; polarization; basic of coherent (laser) and non-coherent optics. *Prereq.* 10.308.

**03.397 Optical Instrumentation I (2 cl., 2 q.h.)**

Treats the classical image forming instruments (telescopes, microscopes, etc.) as components of optical systems. Includes magnification; aberrations; resolution criteria; photometry; compatibility of system components and optimization of systems. Topics in coherent imaging such as phase contrast and holography. *Prereq.* 03.396.

**03.398 Optical Instrumentation II** (2 cl., 2 q.h.)

The basic non-image forming systems used for analysis control and metrology. Includes: spectroscopy, interferometry (classical and holographic), electron-ion optical, and X-Ray systems. *Prereq.* 03.397.

**03.399 Fundamentals of Operational Amplifiers** (2 cl., 2 q.h.)

Emphasis on treating the amplifier as a black box. Covers gain, distortion, feedback, matching, offset, drift, and frequency response. A section on practical applications. *Prereq.* 03.312.

## ENGINEERING GRAPHICS AND COMPUTATION

**09.307 Electrical and Electronic Graphics I** (2 cl., 2 q.h.)

Instrument techniques; principles of projection, drawing, reading and interpretation of multiview drawings; pictorial, representations. *Prereq.* none.

**09.308 Electrical and Electronic Graphics II** (2 cl., 2 q.h.)

An introduction to electronic graphics, including: symbols, schematics, block and logic diagrams, production, cable, and electric power drawings. *Prereq.* 09.307.

**09.309 Electrical and Electronic Graphics III** (2 cl., 2 q.h.)

A study of single- and double-sided printed circuit layout, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq.* 09.308.

**09.311 Engineering Graphics I** (2 cl., 2 q.h.)

Introduction to engineering drawing, geometric construction, charts and graphs, orthographic projection through auxiliary views. *Prereq.* none.

**09.312 Engineering Graphics II** (2 cl., 2 q.h.)

Detail drawing, including intersections and development, reading of multiview drawings, pictorial representation. *Prereq.* 09.311.

**09.313 Engineering Graphics III** (2 cl., 2 q.h.)

Manufacturing processes and dimensioning. Topographical, earth work and structural drawing, analysis of assemblies, design project. *Prereq.* 09.312.

**09.314 Engineering Design I (Kinematics)** (1 cl., 2 lab., 2 q.h.)

Translatory and rotary motion involving basic mechanisms through graphical vector and mathematical analysis of displacement, velocity, and acceleration. Simple, compound, reverted, and epicyclic gear trains. *Prereq.* 09.313, 11.317.

**09.315 Engineering Design II (Drawings)** (1 cl., 2 lab., 2 q.h.)

Drawings and specifications for the production and precision machining of castings, forging, weldments, etc. Discussion of design components. *Prereq.* 09.314.

**09.316 Creative Engineering Design III (Creativity)** (1 cl., 2 lab., 2 q.h.)

Introduction to design through graphical analysis of cams and follower motions. Creativity and design processes through case studies and original projects requiring oral presentation of student's involvement in both synthesis and innovative activities. *Prereq.* 09.315.

**09.351 Principles of Computer Programming I** (2 cl., 2 q.h.)

Rules for forming simple FORTRAN programs. Applications to scientific problems, algorithms for computing infinite sums, maxima and minima in both discrete and continuous cases. Programming in FORGO. *Prereq.* 10.308 or 10.312, 10.314.

**09.352 Principles of Computer Programming II** (2 cl., 2 q.h.)

Extended capabilities of the FORTRAN language. Manipulation of arrays, subroutine and function busprograms. Algorithms to sort arrays, root evaluation. Scientific subroutines, random numbers, A FORMAT. Programming in FORTRAN IV. *Prereq.* 09.351.

**09.353 Principles of Computer Programming III** (2 cl., 2 q.h.)

Introduction to use of plotter, A format graphs, curve fitting, quadrature, evaluation of derivatives, solution of simultaneous equations, program documentation procedures, introduction to simulation. Programming in FORTRAN IV. *Prereq.* 09.352.

**09.354 Computer Systems I (Software Systems)** (2 cl., 2 q.h.)

Storage and retrieval techniques, machine language and symbolic coding, discussion of ALGOL, BASIC and PL/1. *Prereq.* 09.353.

**09.355 Computer Systems II (Hardware Systems)** (2 cl., 2 q.h.)

Card readers, printers, plotters, and other output devices. Tapes, discs, drums and methods for computer files. Data communication equipment, COBOL, processing quality control, computer installation management.

**09.356 Computer Systems III (Operating Systems)** (2 cl., 2 q.h.)

Batch processing, time sharing, mixed systems and multiprogramming, North-eastern University's operating system-MASTER.

**09.357 Computer Aided Design I (Computer Graphics)** (2 cl., 2 q.h.)

Plotter graphs, two dimensional manipulations, 3 to 2 dimensional transforms, three-dimensional manipulations, data generation. *Prereq.* 09.353.

**09.358 Computer Aided Design II (Problem Oriented Languages)** (2 cl., 2 q.h.)

Discussion of popular languages, user oriented requirements, input algorithms, command structure, design of a POL system. *Prereq.* 09.353.

**09.359 Computer Aided Design III (Simulation and Mathematical Models)** (2 cl., 2 q.h.)

Statistical models for random inputs, spectral densities, frequency distribution, multivariable problems, Markovian processes. Modeling of an Engineering system. *Prereq.* 09.357.

**09.361 Computer Controlled Systems I** (2 cl., 2 q.h.)

Open loop systems. Process control programs. Actuators, actuator-computer interface. Component simulation on CDC 3300. *Prereq.* 09.353, 10.326. *Coreq.* 03.371.

**09.362 Computer Controlled Systems II** (2 cl., 2 q.h.)

Simple closed loop systems. Process control programs for history dependent and independent systems. Transducers. Transducer-computer interface. Components simulation on CDC 3300. *Prereq.* 09.361; *Coreq.* 03.372.

**09.363 Computer Controlled Systems III** (2 cl., 2 q.h.)

Sampling theory considerations. Synchronous and asynchronous signals. Random and Sequential sampling. Combined analog and digital techniques, synthesis and implementation of a control system for the regulation of a physical process. Implementation by simulation on CDC 3300 computer. *Prereq.* 09.362; *Coreq.* 03.373.

**03.371 Analog, Digital and Hybrid Computers I** (2 cl., 2 q.h.)

Theory and operation of analog computers. Amplitude scaling and time scaling on the analog computer and application of the analog computer to the solution of linear and non-linear differential equations. *Prereq.* 10.325.

**03.372 Analog, Digital and Hybrid Computers II** (2 cl., 2 q.h.)

Introduction to the field of digital computer design. Topics include general computer organization number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design. *Prereq.* 03.371.

**03.373 Analog, Digital and Hybrid Computers III** (2 cl., 2 q.h.)

Survey of the present state-of-the-art hybrid computers. Problem areas unique to hybrid computers such as interface, analog-to-digital and digital-to-analog conversion will also be discussed. Hybrid computer programming techniques. Direct digital process control computers. *Prereq.* 03.372.

## MATHEMATICS

**10.301 Introduction to Mathematics I** (4 cl., non-credit)

A comprehensive review of high school algebra including: first-degree equations, factoring, fractional equations, word problems, and concepts of plane geometry. *Prereq.* none.

**10.302 Introduction to Mathematics II** (4 cl., non-credit)

Algebraic operations with fractions and mixed expressions, proportions, square roots, radicals, quadratics; simultaneous equations, graphs and fractional exponents. The geometry of the right triangle, areas of polygons, circles, and loci problems. Basic slide rule operation. *Prereq.* 10.301.

**10.330 Basic Mathematics I** (2 cl., non-credit)

A review of elementary algebra; algebraic expressions and operations, equations, word problems. *Prereq.* none.

**10.331 Basic Mathematics II** (2 cl., non-credit)

Further review; operations with polynomials, factoring, fractional expressions, word problems. *Prereq.* 10.330.

**10.501 Mathematics I** (2 cl., 2 q.h.)

Methods and applications of algebra; graphical techniques. *Prereq.* *Math. Placement Test*, 10.331 or 10.302.

**10.502 Mathematics II** (2 cl., 2 q.h.)

Linear and quadratic equations; exponents and radicals; variation. *Prereq.* 10.501.

**10.503 Mathematics III** (2 cl., 2 q.h.)

Review of geometry; topics of trigonometry; introduction to statistics and probability; logarithms. *Prereq.* 10.502.

**10.307 College Algebra and Trigonometry I** (4 cl., 4 q.h.)

Fundamental operations of algebra; algebraic fractions; exponents and radicals; functions. Trigonometric functions of angles both in degree and in radian measure; right triangles; identities and equations. *Prereq.* *Math. Placement Test* or 10.302.

**10.308 College Algebra and Trigonometry II** (4 cl., 4 q.h.)

Quadratic equations and applications; radical equations; complex numbers; binomial expansion; variation; roots of polynomial equations. Trigonometric graphs; other transcendental functions, logarithms, inverse trigonometric functions. *Prereq.* 10.307.

**10.316 Probability and Statistics I** (2 cl., 2 q.h.)

Basic tools, e.g., sets, permutations and combinations; probability and applications. *Prereq.* 10.503, or 10.507 or 10.308.

**10.317 Probability and Statistics II** (2 cl., 2 q.h.)

Descriptive statistics; frequency distributions and probability density functions; normal and other distributions. *Prereq.* 10.316.

**10.318 Probability and Statistics III** (2 cl., 2 q.h.)

Bivariate distributions; correlation; statistical inference and estimation; regression. *Prereq.* 10.317.

**10.320 Calculus I** (4 cl., 4 q.h.)

Functions, graphs, and limits; study of the straight line, the circle, the parabola; differentiation of algebraic functions, with applications, including curve-sketching. *Prereq.* 10.308, 10.503 or 10.507.

**10.321 Calculus II** (2 cl., 2 q.h.)

Applications of derivatives to curve-sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions — logarithmic, exponential, and trigonometric. *Prereq.* 10.320.

**10.322 Calculus III** (2 cl., 2 q.h.)

Calculus of inverse trigonometric functions; techniques of integration — especially integration by parts, and substitution; numerical integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms, L'Hospital's rule. *Prereq.* 10.321.

**10.323 Calculus IV** (2 cl., 2 q.h.)

Calculus of functions of several variables, partial differentiation, multiple integrals, infinite series. *Prereq.* 10.322.

**10.324 Differential Equations I** (2 cl., 2 q.h.)

Vector analysis; matrices and linear algebra. *Prereq.* 10.323.

**10.325 Differential Equations II** (2 cl., 2 q.h.)

Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients. Laplace transforms. *Prereq.* 10.324.



**10.326 Differential Equations III** (2 cl., 2 q.h.)

Series solutions of differential equations; Fourier series and orthogonal functions. *Prereq.* 10.325.

**10.351 Advanced Mathematics I (Numerical Analysis)** (2 cl., 2 q.h.)

Basic methods of numerical analysis — roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations — problems employing the electronic computer. *Prereq.* 09.353 and 10.326.

**10.352 Advanced Mathematics II** (2 cl., 2 q.h.)

Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq.* 10.351.

**10.353 Advanced Mathematics III** (2 cl., 2 q.h.)

Special topics in analysis. *Prereq.* 10.352.

**10.591 Mathematics — A** (3 cl., 3 q.h.)

Methods and applications of algebra; graphical techniques. Linear and quadratic; exponents and radicals. (No credit to students who have passed 10.501, or 10.502, or 10.507). *Prereq.* *Math. Placement Test*, 10.302, or 10.331.

**10.592 Mathematics — B** (3 cl., 3 q.h.)

Variation; review of geometry; topics of trigonometry; introduction to statistics and probability; logarithms. (No credit to students who have passed 10.503.) *Prereq.* 10.591.

**10.361 Modern Algebra I** (2 cl., 2 q.h.)

Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq.* 10.503, 10.507, or 10.508.

**10.362 Modern Algebra II** (2 cl., 2 q.h.)

Field of complex number; groups; subgroups; polynomial rings; homomorphisms; isomorphisms; ideals. *Prereq.* 10.361.

**10.363 Modern Algebra III** (2 cl., 2 q.h.)

Vector spaces; linear transformations; dependence, independence; dimension; applications to engineering, science, and business. *Prereq.* 10.362.

## PHYSICS

*Courses marked \* not available in every curriculum. See curricula in Programs of Instruction section, for applicable sequence, pp. 54-94.*

**11.301 Introductory Physics I** (4 cl., non-credit)

A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. *Prereq.* none.

**11.302 Introductory Physics II** (4 cl., non-credit)

Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetism. *Prereq.* 11.301.

**\*11.304 General Physics I** (2 cl., 2 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion, conservation laws of energy and momentum. *Prereq.* 10.501 or concurrently.

**\*11.305 General Physics II** (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. *Prereq.* 10.304.

**\*11.306 General Physics III** (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq.* 11.305.

**11.317 Physics I (Mechanics)** (4 cl., 4 q.h.)

Kinematics and dynamics of particle motion; Newton's laws; projectile and circular motion; conservation laws for momentum and energy; rotational motion; simple harmonic motion. *Prereq.* 10.307 or concurrently.

**11.318 Physics II (Wave Motion, Sound, Heat)** (4 cl., 4 q.h.)

Wave motion; intensity; interference phenomena; Doppler effect; vibrating systems; temperature; heat; change of state; heat transfer; kinetic theory of gases; general gas laws; thermodynamics. *Prereq.* 11.317.

**11.319 Physics III (Electricity, Magnetism, Light)** (4 cl., 4 q.h.)

Electrostatics; magnetism; magnetic induction; induced currents; direct and alternating current circuits; properties of light; reflection; refraction; dispersion; optical systems; diffraction; polarization. *Prereq.* 11.318.

**11.320 Semiconductor Physics & Devices** (4 cl., 4 q.h.)

Electron Ballistics and applications. Properties of atoms and electrons as related to conduction of electricity in solids. Fundamentals of semiconductors, crystal diodes, and transistors. Theory of field-effect transistors, integrated circuits, and photoelectric devices. (This is a combination of 11.322 and 11.323.) *Prereq.* 11.313, 11.316, or 11.319.

**11.321 Wave Phenomena** (2 cl., 2 q.h.)

Application of fundamental principles of waves to electromagnetic radiation. Waves on transmission lines. Selected topics in antennas and wave guides. *Prereq.* 11.319 or 11.316.

**11.322 Semiconductor Physics** (2 cl., 2 q.h.)

Electron Ballistics and applications. Properties of atoms and electrons as related to conduction of electricity in solids. *Prereq.* 11.319.

**11.323 Semiconductor Devices** (2 cl., 2 q.h.)

Fundamentals of semiconductors, crystal diodes, and transistors. Theory of field-effect transistors, integrated circuits and photoelectric devices. *Prereq.* 11.322.

**11.331 Advanced Physics I** (2 cl., 2 q.h.)

Introduction to theory of relativity; particle properties of waves; wave properties of particles; atomic structure; Bohr model of the atom. *Prereq.* 11.323 and 10.323. (offered alternate years)

**11.332 Advanced Physics II** (2 cl., 2 q.h.)

Quantum mechanics; electron spin; atomic spectra; complex atoms; solid state physics; lasers. *Prereq.* 11.331. (offered alternate years)

**11.333 Advanced Physics III** (2 cl., 2 q.h.)

Atomic nucleus; radioactive decay; thermonuclear energy; nuclear reactions; elementary particles. *Prereq.* 11.332. (offered alternate years)



**11.341 Physics Laboratory I** (3 lab., 2 q.h.)

Experiments in dynamics, two-body kinematics and scattering, geometrical optics and thermodynamics. *Prereq.* 11.319.

**11.342 Physics Laboratory II** (3 lab., 2 q.h.)

Experiments in physical optics, spectroscopy and quantum physics. *Prereq.* 03.341.

**11.343 Physics Laboratory III** (3 lab., 2 q.h.)

Experiments in electricity and magnetism, simple electric and electronic circuits. *Prereq.* 11.342.

**11.391 General Physics — A** (3 cl., 3 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion, conservation laws of energy and momentum. Temperature; heat energy; mechanical equivalent of heat. *Prereq.* 10.591 or concurrently.

**11.392 General Physics — B** (3 cl., 3 q.h.)

Wave motion; sound; Doppler's effect; properties of light; simple optical systems. Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq.* 11.391.

## CHEMISTRY

**12.301 Introductory Chemistry I** (4 cl., non-credit)

A non-mathematical approach to the concepts of chemistry including matter; elements and compounds, chemical bonding, chemical equations. *Prereq.* None.

**12.302 Introductory Chemistry II** (4 cl., non-credit)

A continuation of 12.301, including periodic system, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry. *Prereq.* 12.301.

**12.307 Modern Chemistry I (Intro. to Inorganic Chemistry)** (2 cl., 2 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radio activity, all discussed from the viewpoint of recent developments. *Prereq.* 10.501 or concurrently.

**12.308 Modern Chemistry II (Intro. to Organic Chemistry)** (2 cl. 2 q.h.)

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides, carbohydrates, including the relationship with modern biology. *Prereq.* 12.307.

**12.309 Modern Chemistry III (Intro. to the Chemistry of Living Bodies)**

(2 cl., 2 q.h.)

Includes fats, proteins, enzymes, chemistry of digestion and the chemical reactions characteristic of body fluids. *Prereq.* 12.308.

**12.314 General Chemistry and Laboratory I** (2 cl., 2 lab., 3 q.h.)

Fundamental ideas of matter and energy. Properties of gases, liquids and solids; atomic structure, chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium. Correlated laboratory experiments. *Prereq.* 10.307 or 10.501 or concurrently.  
(Laboratory Fee)

**12.315 General Chemistry and Laboratory II** (2 cl., 2 lab., 3 q.h.)

Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of non-metals and metals; study of families of elements in the Periodic System. Correlated laboratory experiments. *Prereq.* 12.314. (Laboratory Fee)

**12.316 General Chemistry and Laboratory III** (2 cl., 2 lab., 3 q.h.)

Chemistry of related and similar metals; coordination compounds; chemistry of open and closed chain organic compounds; organic chemistry of natural and synthetic products including petroleum, rubber, synthetic resins, plastics, etc. Correlated laboratory experiments. *Prereq.* 12.315. (Laboratory Fee)

**12.321 Analytical Chemistry I** (2 cl., 2 q.h.)

Analytical procedure and technique; application of fundamental concepts of solutions to laboratory work; formulation of numerical terms essential to understanding mass action law, ionic equilibria; solubility product, hydrolysis, and redox constants. *Prereq.* 12.313 or 12.316.

**12.322 Analytical Chemistry II** (2 cl., 2 q.h.)

Weighing, measurement of volumes, titration, filtration, ignition, and combustion are considered from standpoint of theoretical principles involved and manipulative technique necessary. Combination of these operations and their application to actual analysis; comprehensive study of volumetric methods and more elementary parts of gravimetric analysis. Problems are introduced to emphasize correct calculation of analytical results as well as procedures. *Prereq.* 12.321.

**12.323 Analytical Chemistry III** (2 cl., 2 q.h.)

Elements of instrumental analysis. Theoretical principles involved in the use of colorimeter, absorption instruments, Ph measurements, chromatography, etc. *Prereq.* 12.322.

**12.324 Analytical Chemistry Laboratory I** (3 lab., 2 q.h.)

Principles of qualitative chemistry applied to actual problems. Separations and identification of known and unknown solutions. Finally these are combined into a comprehensive system of analysis which is applied to artificially prepared mixtures and industrial materials. *Prereq.* 12.316 or equivalent and 12.321 or concurrently. (Laboratory Fee)

**12.325 Analytical Chemistry Laboratory II** (3 lab., 2 q.h.)

Analytical methods used in qualitative chemistry. Volumetric analysis including acidmetry and alkalimetry, oxidation, reduction, and precipitation methods followed by simple gravimetric analysis. *Prereq.* 12.324. (Laboratory Fee)

**12.326 Analytical Chemistry Laboratory III** (3 lab., 2 q.h.)

Practical applications of instrumental analysis with experience in the use of colorimeter, absorption instruments, pH measurements, chromatography, etc. *Prereq.* 12.325. (Laboratory Fee)

**12.331 Organic Chemistry I** (2 cl., 2 q.h.)

Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions, of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Introduction to free radical and ionic mechanisms of reactions. *Prereq.* 12.313 or 12.316.

**12.332 Organic Chemistry II** (2 cl., 2 q.h.)

Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed. *Prereq.* 12.331.

**12.333 Organic Chemistry III** (2 cl., 2 q.h.)

Continuation of Chemistry 12.332 with emphasis on the application of chemical interconversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes and ketones. *Prereq.* 12.332.

**12.334 Organic Chemistry Laboratory I** (3 lab., 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed. *Prereq.* 12.316 or equivalent and 12.331 or concurrently. (Laboratory Fee)

**12.335 Organic Chemistry Laboratory II** (3 lab., 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed. *Prereq.* 12.334.

(Laboratory Fee)

**12.336 Organic Chemistry Laboratory III** (3 lab., 2 q.h.)

Co-ordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed. *Prereq.* 12.335.

(Laboratory Fee)

**12.341 Physical Chemistry I** (2 cl., 2 q.h.)

The three states of matter, atomic and molecular forces, physical properties and molecular structure; heat, work and heat capacity; thermochemistry. *Prereq.* 12.313 or 12.316.

**12.342 Physical Chemistry II** (2 cl., 2 q.h.)

Thermodynamics, solutions, chemical equilibria, phase diagrams, and chemical kinetics. *Prereq.* 12.341.

**12.343 Physical Chemistry III** (2 cl., 2 q.h.)

Electrical conductance, electromotive force, ionic equilibria, colloids, quantum theory, and photochemistry. *Prereq.* 12.342.

**12.351 Instrumental and Radiochemistry I** (2 cl., 2 q.h.)

Definitions, physical principles, scope and application; principles of measurement; endpoint-detection systems for volumetric analysis, data treatment and interpretation. Optical methods of analysis including spectrophotometry, excitation methods, measurements of other optical properties, and mass spectrometry. *Prereq.* 12.323.

**12.352 Instrumental and Radiochemistry II** (2 cl., 2 q.h.)

Methods of separation, vapor phase chromatography, ion exchangers; electrical methods of analysis including potentiometry, voltammetry, coulometry, and conductimetry; miscellaneous instrumental measurements. *Prereq.* 12.351.

**12.353 Instrumental and Radiochemistry III** (2 cl., 2 q.h.)

Radioactivity and nuclear reactions, production and study of nuclear reactions, equations of radioactive decay, nuclear states and radioactive processes, interaction of radiations with matter, radiation detection and measurement, statistics of radioactivity measurements, techniques for the study of radionuclides, tracers in chemical applications and nuclear energy. *Prereq.* 12.352.

**12.381 Nuclear Technology I** (2 cl., 2 q.h.)

Atomic and nuclear structure, discovery and nature of radio activity. Nuclear reactions and energy; induced nuclear transformations; neutron properties; applications of radionuclides. Supplementary laboratory experiments. *Prereq.* 10.323 and 11.316.

**12.382 Nuclear Technology II** (2 cl., 2 q.h.)

Radiological safety — the hazards, problems, and protection. Nuclear instrumentation for particle detection, monitoring, and experimentation. Supplementary laboratory experiments. *Prereq.* 12.381.

**12.383 Nuclear Technology III** (2 cl., 2 q.h.)

The fission process and its applications; nuclear reactors — their classification, design and application; nuclear fuel processing; radioactive waste disposal. Supplementary laboratory experiments. *Prereq.* 12.382.

## EARTH SCIENCE

**16.531 Oceanography I** (2 cl., 2 q.h.)

An introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world. *Prereq.* *Earth Sci. equivalency.*

**16.532 Oceanography II** (2 cl., 2 q.h.)

The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and nekton are discussed. The growing economic importance of marine resources for the expanding world population. *Prereq.* 16.531 or equivalent.

**16.533 Marine Geology** (2 cl., 2 q.h.)

Physiography and structure of ocean basins. Marine geological processes and features, including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration. *Prereq.* *Earth Sci. equivalency.*

**16.541 Meteorology I** (2 cl., 2 q.h.)

Introduction to the structure, composition and phenomena of the atmosphere. Consideration of solar radiation, aurora, airglow, meteors, and radio propagation in the upper atmosphere, followed by a detailed examination of the major weather elements, related measuring instruments and global wind circulation of the troposphere. Laboratory exercises include plotting horizontal and vertical variations in temperature, pressure, and moisture, with analysis of the dynamic interrelationships involved. *Prereq.* *Earth Sci. equivalency.*

**16.542 Meteorology II** (2 cl., 2 q.h.)

Study of secondary wind circulation, air masses, frontal systems, thunderstorms, hurricanes, and tornadoes. Techniques in local short-range and regional long-range forecasting, with special attention to New England conditions. Laboratory exercises in synoptic weather maps preparation, analysis, and interpretation. *Prereq.* 16.541 or equivalent.

**16.543 Climatology** (2 cl., 2 q.h.)

Classification, analysis, and geographic distribution of climatic types. Consideration of microclimates and relationship of weather and climatic elements to other factors in the natural environment and human activities. Opportunity provided to apply effects of these elements to a chosen area of personal interest. *Prereq.* *Earth Sci. equivalency.*

**16.551 Astronomy I** (2 cl., 2 q.h.)

Direction, orientation, and division of space and time. The six main types of bodies of the solar systems in terms of their observed properties and motions.

*Prereq.* Earth Sci. equivalency.

**16.552 Astronomy II** (2 cl., 2 q.h.)

Light as part of the electromagnetic spectrum and as a fundamental basis of man's observations. A survey of light and radio telescopes, spectroscopes, and other tools of astronomy. The sun as a typical star. *Prereq.* 16.551 or equivalent.

**16.553 Astronomy III** (2 cl., 2 q.h.)

Stellar classification, variety, and evolution as fundamentals in the understanding of clusters, galaxies, and cosmology. *Prereq.* 16.522 or equivalent.

**BIOLOGY****18.304 Integrated Science I** (3 cl., 3 lab., 4 q.h.)

Principles of chemistry; principles of biology. *Prereq.* none. (Laboratory Fee)

**18.305 Integrated Science II** (3 cl., 3 lab., 4 q.h.)

Human anatomy and physiology. *Prereq.* 18.304. (Laboratory Fee)

**18.306 Integrated Science III** (3 cl., 3 lab., 4 q.h.)

Introduction to essential topics in the major areas of biology; physico-chemical background of biology. *Prereq.* 18.305. (Laboratory Fee)

**18.307 Gross Anatomy and General Physiology I** (2 cl., 2 q.h.)

Fundamental concepts of living organisms, chemical and biological characteristics of cellular metabolism. The skeletal system and its appendages. General nomenclature, anatomical names and terms. *Prereq.* none.

**18.308 Gross Anatomy and General Physiology II** (2 cl., 2 q.h.)

The systems of the body and the relationships between them. The structure and function of each. *Prereq.* 18.307.

**18.309 Gross Anatomy and General Physiology III** (2 cl., 2 q.h.)

Continuation of the systems of the body and the relationship between them. *Prereq.* 18.308.

**18.311 Biology I (General)** (3 cl., 3 lab., 4 q.h.)

Universal properties and processes of living organisms. Cellular composition and cellular activities; inheritance and cellular control; the evolutionary process; environmental relationships. *Prereq.* none. (Laboratory fee)

**18.312 Biology II (Animal)** (3 cl., 3 lab., 4 q.h.)

Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. *Prereq.* 18.311. (Laboratory Fee)

**18.313 Biology III (Plant)** (3 cl., 3 lab., 4 q.h.)

Systematic study of the structure and function of plants, principally vascular plants. Survey of the plant-like protists, and monerans. *Prereq.* 18.312. (Laboratory Fee)

**18.314 Botany I** (2 cl., 2 q.h.)

The plant cell, tissue, and parts of flowering plants. *Prereq.* 18.313.

**18.315 Botany II** (2 cl., 2 q.h.)

Classification of the plant kingdom, plantal life histories. *Prereq.* 18.314.

**18.316 Botany III** (2 cl., 2 q.h.)

Physiology and life activities of plants. *Prereq.* 18.315.

**18.321 Microbiology I** (2 cl., 4 lab., 4 q.h.)

Morphology and biochemistry of the bacteria. *Prereq.* 18.313. (Laboratory Fee)

**18.322 Microbiology II** (2 cl., 4 lab., 4 q.h.)

Biology of the protists; the role of microorganisms in the environment. *Prereq.* 18.321. (Laboratory Fee)

**18.323 Microbiology III** (2 cl., 4 lab., 4 q.h.)

Survey of pathogenic microorganism. (Laboratory Fee)

**18.324 Human Anatomy and Physiology I** (2 cl. 2 lab., 3 q.h.)

Introduction to human anatomy, osteology, anatomy of the muscular system, respiratory system, digestive system, the vascular system, urogenital system. The laboratory includes a study of human bones and cat dissection. *Prereq.* 18.306 or 18.313.

**18.325 Human Anatomy and Physiology II** (2 cl., 2 lab., 3 q.h.)

Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. *Prereq.* 18.324.

**18.326 Human Anatomy and Physiology III** (2 cl., 2 lab., 3 q.h.)

Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory deals with physiology of respiration and the physiology of blood. *Prereq.* 18.325.

**18.329 Seminar In Medical Technology** (2 cl., 2 q.h.)

Current topics in medical technology. Required readings and presentations by students. Guest lecturers. *Prereq. instructor permission.*

**18.341 Hematology I** (1 cl., 3 lab., 2 q.h.)

Basic hematological techniques including discussion of the differential smear and observation of the normal morphology of human red cells, white cells, and platelets. *Prereq.* 18.313. (Laboratory Fee)

**18.342 Hematology II** (1 cl., 3 lab., 2 q.h.)

Morphologic and etiologic classification of the anemias. Related diagnostic tests will be discussed. *Prereq.* 18.341. (Laboratory Fee)

**18.343 Hematology III** (1 cl., 3 lab., 2 q.h.)

Studies of pathologic and physiologic deviations of the white cell series as observed in leukemias and infections. Some animal hematology will be included. *Prereq.* 18.342. (Laboratory Fee)

**18.351 Histology-Organology I** (1 cl., 2 lab., 2 q.h.)

The morphology of cells and tissues. *Prereq.* 18.313. (Laboratory Fee)

**18.352 Histology-Organology II** (1 cl., 2 lab., 2 q.h.)

The issue components of the integumentary, digestive, and respiratory systems. *Prereq.* 18.351. (Laboratory Fee)



**18.353 Histology-Organology III** (1 cl., 2 lab., 2 q.h.)

The tissue components of the cardiovascular, excretory, reproductive, and endocrine systems. *Prereq.* 18.352. (Laboratory Fee)

**18.357 Genetics I** (1 cl., 2 lab., 2 q.h.)

Mitosis, meiosis, and, mendelian genetics. *Prereq.* 18.313. (Laboratory Fee)

**18.358 Genetics II** (1 cl., 2 lab., 2 q.h.)

Chromosome mapping, mutations, translocation, chromosomal aberrations. *Prereq.* 18.357. (Laboratory Fee)

**18.359 Genetics III** (1 cl., 2 lab., 2 q.h.)

Population genetics, aspects of biochemical genetics. *Prereq.* 18.358. (Laboratory Fee)

**18.360 Environmental Ecology** (4 cl., 4 q.h.)

Biotic and abiotic aspects of the environment. Geo-physico-chemocycles in the biosphere. Food chain and the ecosystem. Energy cycling. Environmental pollution. Population explosion and natural resources. Future of man as a species. Role of government, industry, and individuals in controlling the environment. *Prereq.* none.

**18.391 Photomicroscopy** (1 ch., 2 lab., 2 q.h.)

(not offered 1969-70).

**18.361 Ecology I** (2 cl., 2 q.h.)

Environmental factors. The soil system. Water. The atmosphere. Temperature, light, wind, pressure. The physico-chemical factors — CO<sub>2</sub>, N and mineral nutrients. Habitat. Distribution of plants and animals in the world according to temperature and precipitation. *Prereq.* 18.313.

**18.362 Ecology II** (2 cl., 2 q.h.)

The ecosystem. Ecological niche. The producers, consumers, and decomposers. The pond ecosystem, desert ecosystem, forest ecosystem, and sea shore ecosystem. Energy cycle and efficiency of energy utilization. Mass, weight, and energy pyramids. *Prereq.* 18.361.

**18.363 Ecology III** (2 cl., 2 q.h.)

Population ecology. Biotic community. Population growth. Relations between the species. Symbiosis. Competition. Predation. Succession. *Prereq.* 18.362.

## PHARMACOLOGY

**73.311 Clinical Biochemistry I** (1 cl., 3 lab., 2 q.h.)

Enzymes and hormones of clinical and pathologic interest with experiments to interpret disordered biochemistry. *Prereq.* 12.323, 12.333, 18.323.

(Not offered 1969-70.) (Laboratory Fee)

**73.312 Clinical Biochemistry II** (1 cl., 3 lab., 2 q.h.)

Pathogenesis of renal tubular dysjunction, intestinal malabsorption syndromes, hormone assay and significance, and endocrine functions. *Prereq.* 73.311.

(Not offered 1969-70.) (Laboratory Fee)

**73.313 Clinical Biochemistry III** (1 cl., 3 lab., 2 q.h.)

Abnormality of electrolyte metabolism, lipid transport and mobilization histochemical technics, vitamin abnormalities, clinical aspects of biochemical genetics and radioisotopic applications. *Prereq.* 73.312 (Laboratory Fee)  
(Not offered 1969-70.)

**LIBERAL ARTS**

*Students wishing to elect other humanities, social science, and natural science courses should refer to the University College Catalog and petition for approval by the Committee on Education of Lincoln College.*

**19.501 Psychology I** (2 cl., 2 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning. *Prereq.* none.

**19.502 Psychology II** (2 cl., 2 q.h.)

Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq.* 19.501 or equivalent.

**19.503 Psychology III** (2 cl., 2 q.h.)

Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *Prereq.* 19.502 or equivalent.

**19.507 Psychology (Intensive)** (6 cl., 6 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning. Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurement, behavior disorders, mental health, and psychotherapy. (Not open to students who have taken 19.501, 19.502, 19.503.) *Prereq.* none.

**21.501 Sociology I** (2 cl., 2 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. *Prereq.* 30.506, 30.602 or equivalent or concurrently.

**21.502 Sociology II** (2 cl., 2 q.h.)

A continuation of Sociology I with major emphasis on primary groups, associations, social stratification, collective behavior, and population. *Prereq.* 21.501 or equivalent.

**21.503 Sociology III** (2 cl., 2 q.h.)

A continuation of Sociology II focusing on the major institutional areas, with particular attention to problems of social, political, urban, and industrial change. *Prereq.* 21.502 or equivalent.

**21.504 Sociology (Intensive)** (6 cl., 6 q.h.)

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. Primary groups, associations, social stratification, collective behavior, and population. The major institutional areas, with particular attention to problems of social, political, urban, and industrial change. (Not open to students who have taken 21.501, 21.502, 21.503.) *Prereq.* 30.506, 30.602 or equivalent or concurrently.



**23.501 Western Civilization I** (2 cl., 2 q.h.)

The beginnings of Western civilization with emphasis on the political, economic, and social history of the ancient and medieval world. *Prereq. none.*

**23.502 Western Civilization II** (2 cl., 2 q.h.)

Modern Europe to 1815 with an examination of the two major intellectual movements — the Renaissance and the Enlightenment — and their impact upon religious movements, economic developments, and the rise of national states. *Prereq. none.*

**23.503 Western Civilization III** (2 cl., 2 q.h.)

Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace. *Prereq. none.*

**23.507 Western Civilization (Intensive)** (6 cl., 6 q.h.)

The beginnings of Western civilization with emphasis on the political, economic, and social history of the ancient and medieval world. Modern Europe to 1815 with an examination of the two major intellectual movements — the Renaissance and the Enlightenment — and their impact upon religious movements, economic developments, and the rise of national states. Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace. (Not open to students who have taken 23.501, 23.502, 23.503.) *Prereq. none.*

**30.501 English for International Students I** (2 cl., non-credit)

Introduction to English grammar for foreign-speaking students with an emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation. *Prereq. none.*

**30.502 English for International Students II** (2 cl., non-credit)

A continuation for 30.501 emphasizing the preparation of written and oral reports and business and social correspondence. *Prereq. 30.501.*

**30.503 English for International Students III** (2 cl., non-credit)

Advanced work in written and spoken English preparatory to entering 30.504 English I. *Prereq. 30.502.*

**\*30.594 English — A** (3 cl., 3 q.h.)

Aims and methods of exposition, description and narration; investigation of phrasing and syntax; analysis of essays for content, structure, and effectiveness; theme assignments to develop skill in writing. Aims and methods of argumentation; study of documentation techniques, form, and style of critical essays. *Prereq. none.*

**30.595 English — B** (3 cl., 3 q.h.)

Practice in library research; analysis and discussion of short stories; theme assignments. Continuation of study of documentation techniques and form and style of critical essays; continuation of analysis and discussion of short stories; writing business and social correspondence; theme assignments. *Prereq. 30.594.*

**30.600 Elements of Composition** (2 q.h.)

An intensive study of grammatical forms and structural patterns of current English.

**30.601 Composition and Rhetoric I (2 q.h.)**

A detailed examination of the modes of rhetoric, especially exposition and argument, and the exercises in the development of paragraphs and short papers. *Prereq. English Placement Test.*

**30.602 Composition and Rhetoric II (2 q.h.)**

A continuation of 30.601. The stress here is on the short paper, the longer library paper, and formal documentation. *Prereq. 30.601.*

**30.603 Composition and Rhetoric (Intensive) (4 q.h.)**

Same as 30.601 *plus* 30.602.

**30.604 Introduction to Literary Forms I (2 q.h.)**

The development of techniques for reading imaginative writing. Short and long fiction are the materials for study, discussion, and two critical papers. *Prereq. 30.602.*

**30.605 Introduction to Literary Forms II (2 q.h.)**

A continuation of 30.604, but here the materials are poetry and drama. *Prereq. 30.604.*

**30.606 Introduction to Literary Forms (Intensive) (4 q.h.)**

Same as 30.604 *plus* 30.605.

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A student wishing to enroll in 30.601 or 30.602 should take an English Placement Examination prior to registration. If his score is satisfactory, he will be entitled to register for 30.601 (Composition and Rhetoric I). If not, he will be entitled to enroll for 30.600 (Elements of Composition) a 2 quarter hour credit course designed to improve his command of written English.

During the changeover of English requirements, the following will apply:

Students who have successfully completed:

30.504 may register for 30.602

30.505 may register for 30.604

30.507 may register for 30.605

## BUSINESS MANAGEMENT

*Students wishing to elect other business courses should refer to the University College catalogue and petition for approval by the Committee on Education of Lincoln College.*

**39.501 Economic Principles and Problems I (2 cl., 2 q.h.)**

Macro analysis-National income concepts and determination; macro economic goals and problems; monetary and fiscal policy. *Prereq. none.*

**39.502 Economic Principles and Problems II (2 cl., 2 q.h.)**

Micro analysis-Theory of the firm and market structure; supply, demand, market price; international economics. *Prereq. 39.501.*

**39.503 Economic Principles and Problems III (2 cl., 2 q.h.)**

Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. *Prereq. 39.502.*

**39.504 Economics (Intensive) (6 cl., 6 q.h.)**

Macro analysis-National income concepts and determination; macro economic goals and problems; monetary and fiscal policy. Micro analysis-Theory of the firm and market structure; supply, demand, market price; international economics. Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. (Not open to students who have taken 39.501, 39.502, 39.503.) *Prereq. none.*

**39.510 Statistics for Quality Control (2 cl., 2 q.h.)**

Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control. Frequency distributions, measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard deviation of the mean. Combinations and permutations and their use of compute probabilities computations associated with the hypergeometric, binomial, and Poisson distributions. *Prereq. 10.503 or equiv.*

**39.511 Statistics I (2 cl., 2 q.h.)**

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq. 39.503.*

**39.512 Statistics II (2 cl., 2 q.h.)**

Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution and chi square. *Prereq. 39.511.*

**39.513 Statistics III (2 cl., 2 q.h.)**

Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment and index numbers. *Prereq. 39.512.*

**39.514 Statistics (Intensive) (6 cl., 6 q.h.)**

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment and index numbers. Not open to students who have taken 39.511, 39.512, 39.513. *Prereq. 39.503.*

**41.501 Accounting Principles I (2 cl., 2 q.h.)**

The basic concepts and methodology of accounting for service and merchandising businesses. *Prereq. none.*

**41.502 Accounting Principles II (2 cl., 2 q.h.)**

The problems of income measurement and valuation related to sources and uses of invested capital. *Prereq. 41.501.*

**41.503 Accounting Principles III (2 cl., 2 q.h.)**

The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. *Prereq. 41.502.*

**41.541 Accounting Principles (Intensive) (6 q.h.)**

Basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. Not open to students who have taken 41.501, 41.502, 41.503.

**45.501 Management and Organization I (2 cl., 2 q.h.)**

Course describes the environment within which business operates and from this develops the theory and practice of organization. *Prereq. none.*

**45.502 Management and Organization II (2 cl., 2 q.h.)**

Building on 45.501, this course develops the "what" and "how" of the management process. *Prereq. 45.501.*

**45.503 Management and Organization III (2 cl., 2 q.h.)**

This course applies the concepts of organization and management to the functional areas of business — marketing, production, personnel and finance. *Prereq. 45.502*

**45.652 Management and Organization (Intensive) (6 q.h.)**

Course describes the environment within which business operates and from his develops the theory and practice of organization. Continuing, this course develops the "what" and "how" of the management process. The concepts of organization and management to the functional areas of business-marketing, production, personnel, and finance. Not open to students who have taken 45.501, 45.502, 45.503.

**45.541 Law I (2 cl., 2 q.h.)**

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts. *Prereq. none.*

**45.542 Law II (2 cl., 2 q.h.)**

AGENCY: Nature, formation and termination of agency relationships; rights and duties of principal and agent, scope of agent's authority. *Prereq. 45.541.*

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. *Prereq. 45.541.*

**45.543 Law III (2 cl., 2 q.h.)**

NEGOTIABLE INSTRUMENTS: Bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge. *Prereq. 45.542.*

BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. *Prereq. 45.542.*

**45.643 Law (Intensive) (6 q.h.)**

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts. AGENCY: Nature, formation and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority. SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. NEGOTIABLE INSTRUMENTS: Bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge. BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. Not open to students who have taken 45.541, 45.542, 45.543.

**45.561 Statistical Quality Control (2 cl., 2 q.h.)**

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control, and quality improvement of products and services; the tools for reducing and controlling the costs of scrap, rework, repair, customer complaints and warranty. The determination of process capability; use of histograms to identify abnormal variability; the use of quality-control charts for measurable and nonmeasurable quality characteristics, including Shewhart, Multi-Vari, median, per cent defective and defects per unit; corrective-action techniques; complying with government quality-control-system requirements; psychological factors in controlling quality. *Prereq. 45.635 or 39.513.*

**45.562 Statistical Quality Control II** (2 cl., 2 q.h.)

Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work-in-process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the Poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Use of standard sampling tables to select appropriate sampling plans, including Mil-Std-105 and 414; practical administration of sampling programs, material review boards, and quality audit. *Prereq.* 45.561.

**45.563 Management of Quality Control** (2 cl., 2 q.h.)

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost. The idea of total quality control; measurement of the costs of quality; use of Pareto's Rule to identify the major unsolved quality problems, development of a coordinated program of improvement, organizing for diagnosing the direct causes. The quality control system; improvement and control of vendor quality in process control; outgoing product control; customer quality relations. Organizing of the quality function.

**45.608 Quality Control (Intensive)** (6 q.h.)

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. The application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the Poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Not open to students who have taken 45.561, 45.562, 45.563. *Prereq.* 39.513.

**45.570 Electronic Data Processing I** (2 cl., 2 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. *Prereq.* none.

**45.571 Electronic Data Processing II** (2 cl., 2 q.h.)

A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. *Prereq.* 45.570.

**45.572 Electronic Data Processing III** (2 cl., 2 q.h.)

A presentation of COBOL, FORTRAN and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. *Prereq.* 45.571.

**45.648 Electronic Data Processing (Intensive)** (6 q.h.)

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; a study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of

filtering and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL, FORTRAN and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. Not open to students who have taken 45.570, 45.571, 45.572.

**48.501 Transportation Management I** (2 cl., 2 q.h.)

Basic principles of management and organization, evaluation of all transportation modes, and primary concepts of freight classification and rates. *Prereq. none.*

**48.502 Transportation Management II** (2 cl., 2 q.h.)

Study of primary management functions — use of tariffs, routing, document processing, analysis of special carrier services and liabilities, and control of private carrier operations. *Prereq. 48.501.*

**48.503 Transportation Management III** (2 cl., 2 q.h.)

Appraisal of federal transport policy and introduction to factors of physical distribution — inventory control, warehousing, material handling, packaging, and international distribution. *Prereq. 48.502.*

**48.504 Transportation Regulation and Promotion I** (2 cl., 2 q.h.)

Study of the history and content of the Interstate Commerce Act. *Prereq. 48.503.*

**48.505 Transportation Regulation and Promotion II** (2 cl., 2 q.h.)

Examination of Administrative Law and Procedure, the Code of Ethics and the General Rules of Practice. *Prereq. 48.504.*

**48.506 Transportation Regulation and Promotion III** (2 cl., 2 q.h.)

Analysis of cases pertinent to the Commerce Clause and comprehensive preparation for the Interstate Commerce Commission Practitioners Examination. *Prereq. 48.505.*

**48.508 Physical Distribution Management A**

The what and why of physical distribution management — how much should you know? Total cost concepts and tradeoffs.

**48.509 Physical Distribution Management B**

The what and why of systems approach. How do computers, inventory control, warehouses, measurement, plant location, and the organization chart fit in?

**48.541 Air Transportation Management I** (2 cl., 2 q.h.)

Economics and regulation of Civil Aeronautics Board certificated commercial passenger aviation — including routes, schedules, operations, pricing, cost analysis, and financing. *Prereq. none.*

**48.542 Air Transportation Management II** (2 cl., 2 q.h.)

Similar analysis as 48.541 for cargo operations. *Prereq. 48.541.*

**48.543 Air Transportation Management III** (2 cl., 2 q.h.)

Economics and regulation of general aviation including analysis of corporate, air taxi, and third level operations. *Prereq. 48.542.*

**48.591 Transportation Management A** (3 cl., 3 q.h.)

Evaluation of all transportation modes, singly and in combination with one another. Analysis of the bill of lading and other transportation documents. Study of primary concepts in transportation pricing; freight classification, classification rule, and freight dates. Study of primary freight-management functions; use of tariffs and rate procedure with carrier bureaus and the Interstate Commerce Commission; routing and consolidation of freight. *Prereq. none.*



**48.592 Transportation Management B** (3 cl., 3 q.h.)

Special services performed by carriers — diversion and reconsignment, transit, protective services, storage, tracing, switching, pickup and delivery, weighing, loading and unloading; freight — claim procedure and prevention. Management of a private transportation system; exporting and importing; inventory management; materials handling and packaging; warehousing; and factors of industrial location. *Prereq.* 48.591.

**48.593 Air Transportation Management A** (3 cl., 3 q.h.)

The economics and regulation of scheduled passenger service and scheduled-cargo service. Corporate and general aviation policy-making and procedures. *Prereq.* none.

**48.594 Air Transportation Management B** (3 cl., 3 q.h.)

Areas of specific study include route structures, equipment, scheduling, operations, pricing, cost analysis, and financing. *Prereq.* 48.593.

## RADIOLOGIC TECHNOLOGY

**86.301 Radiologic Technology Orientation I** (2 cl., 1 q.h.)

A study of the history of x-rays; ethics; terminology used in radiologic technology. *Prereq.* none.

**86.302 Radiologic Technology Orientation II** (2 cl., 1 q.h.)

Nursing and dental procedures pertinent to Radiologic Technology. *Prereq.* 86.301.

**86.303 Radiologic Technology Orientation III** (2 cl., 1 q.h.)

A study of pediatrics relating to proper methods of irradiating. The study of medical and surgical diseases and the effects they have on anatomy and physiology and the resultant radiography. *Prereq.* 86.302.

**86.304 Radiologic Science I** (3 cl., 3 q.h.)

A survey of the basic concepts of physics; units of measurement; Newton's Law of Motion; work; energy; Conservation of energy; Heat transfer and wave motion. *Prereq.* none.

**86.305 Radiologic Science II** (3 cl., 3 q.h.)

Properties of lightwaves; optics; currents; magnetism; electric currents; motors; generators; inductance; atomic theory and x-rays. *Prereq.* 86.304.

**86.306 Radiologic Science III** (3 cl., 3 q.h.)

Atomic structure of matter; radio activity; production and control of high voltage; rectification; nature and production of x-rays; interaction of x-rays and matter; dosimetry; x-ray circuits and tubes. *Prereq.* 86.305.

**86.311 Radiologic Technology I** (3 cl., 3 q.h.)

A study of the planes of the body; basic positioning of the skeletal system to best demonstrate the desired area. *Prereq.* none.

**86.312 Radiologic Technology II** (3 cl., 3 q.h.)

Organizational factors of the hospital; department of radiology; financial consideration; legal considerations and the necessity for correct records and filing systems; advanced positioning. *Prereq.* 86.311.

**86.313 Radiologic Technology III (3 cl., 3 q.h.)**

Proper care and maintenance of x-ray equipment; mechanical and electrical breakdowns; test equipment necessary; special procedures used in radiology and indications for doing them. *Prereq.* 86.312.

**86.314 Advanced Radiologic Technology I (2 cl., 2 q.h.)**

Review of basic principles; new equipment (operation); special procedures; thermography; ultrasound and video; anatomy and physiology. *Prereq.* R. T. or special permission.

**86.315 Advanced Radiologic Technology II (2 cl., 2 q.h.)**

The study of specialized procedures which utilize advanced and sophisticated equipment in the field of: neurology; cardio-vascular, pediatrics, tomography, intraoral, operative procedures. *Prereq.* 86.314.

**86.316 Advanced Radiologic Technology III (2 cl., 2 q.h.)**

Accounting principles; budgeting, preparing schedules; personnel practices. *Prereq.* 86.315.

**86.317 Radioactive Isotopes and Therapy I (2 cl., 2 q.h.)**

Review of physics, mathematics, anatomy, treatment planning, radiation units of measurement, and introduction to radioisotopes. *Prereq.* 86.316.

**86.318 Radioactive Isotopes and Therapy II (2 cl., 2 q.h.)**

Radiobiology, nursing procedures, protection and shielding, and supervoltage equipment. *Prereq.* 86.317.

**86.319 Radioactive Isotopes and Therapy III (2 cl., 2 q.h.)**

Specific procedures, records and administrative procedures, clinical application, and radiobiology. *Prereq.* 86.318.

**86.331 Radiologic Photography and Exposure I (2 cl., 2 q.h.)**

A study of the basic principles of image formation; factors controlling and affecting exposure; contrast materials used to outline organs, vessels, tissues. *Prereq.* none.

**86.332 Radiologic Photography and Exposure II (2 cl., 2 q.h.)**

Critiquing film for contrast, density, detail, artifacts, and information content; exposure mathematics and a review of basic principles. *Prereq.* 86.331.

**86.333 Radiologic Photography and Exposure III (2 cl., 2 q.h.)**

Methods of protection for patients and personnel; effects of radiation on tissue: therapy; therapy planning and treatment; uses of radioactive isotopes. *Prereq.* 86.332.

**86.341, 342, 343 Applied Radiology and Practicum (6 q.h.)**

Application of theoretical principles presented at the University by actually performing radiographic examinations under supervision until qualified to proceed alone. Assigned homework to be incorporated into the lesson plans while at the hospital; and lectures to be presented by personnel in hospital contingent with lectures at the University.

As required by A.M.A. (2 hours week)

**86.344, 345, 346 Advanced Radiology and Practicum (6 q.h.)**

A continuation of lectures as required by A.M.A. (2 hours week), radiological principles, exposure, film critique, special procedures, therapy and isotopes. Application of theoretical principles learned. Students assuming responsibility for examinations of all types (call, weekends, etc.) *Prereq.* 86.341, 342, 343.



## HEALTH CARE

### **86.502 Hospital Law and Ethics** (2 cl., 2 q.h.)

A study of important legal principles and rulings of importance to medical administrative personnel and others. Brief introduction to interpersonal ethics in patient care. *Prereq. none.*

### **86.504, 86.505, 86.506 Foundations of Medical Science I, II, III** (6 q.h.)

Study, primarily through physicians lectures, of major disease problems in our society and modes of treatment. Intended for the non-medical student who wishes an understanding of the problems faced by the physician in daily practice, to facilitate communication between medical and non-medical members of the health team. Discusses organized care; diagnosis; treatment. *Prereq. none.*

### **86.507, 86.508 Medical Terminology I, II** (4 q.h.)

An intensive introduction to medical terminology: stems, prefixes, suffixes. Practice in usage. *Prereq. none.*

## AVIATION TECHNOLOGY

### **96.301 Air Science & Navigation I** (2 cl., 2 q.h.)

Basic flight concepts, map projections, preflight planning, course plotting. Basic radio navigational systems and application. *Prereq. 96.345 or equivalent test.*

### **96.302 Air Science & Navigation II** (2 cl., 2 q.h.)

Topographic information, navigational instruments, mechanical aids, plotters to computers. Civil aviation route level structure, F.A.A. regulations as they effect airway navigation. *Prereq. 96.301.*

### **96.303 Air Science & Navigation III** (2 cl., 2 q.h.)

Basic and advanced concepts of aeronautical systems. Structural airframe requirements and operating limitations, substructures. Principles of propulsion. *Prereq. 96.302.*

### **96.304 Advanced Air Science & Navigation I** (2 cl., 2 q.h.)

Aircraft power plants, flight instruments, Turbojet operating characteristics. Advanced wing and airfoil forces. Planform effects and airplane drag. *Prereq. 96.303 & 11.306.*

### **96.305 Advanced Air Science Navigation II** (2 cl., 2 q.h.)

Aircraft performance. Stability and Control. High speed aerodynamics. Application of aerodynamics to specific problems of flight. *Prereq. 96.304.*

### **96.306 Advanced Air Science & Navigation III** (2 cl., 2 q.h.)

Continuation of application of aerodynamics to specific flight problems and modern aircraft design. *Prereq. 96.305.*

### **96.311 Aviation Meteorology I** (2 cl., 2 q.h.)

A survey of the principles of meteorology and structure of the atmosphere. Meteorological instruments and observations. *Prereq. 11.306 or equiv.*

**96.312 Aviation Meteorology II** (2 cl., 2 q.h.)

Weather map interpretation and common aviation weather teletype codes. Physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations. *Prereq.* 96.311.

**96.313 Climatology** (2 cl., 2 q.h.)

Climate causes and effects. Climatology of several regions of the world. Application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq.* 96.312.

**96.321 Avionics I** (2 cl., 2 q.h.)

Radio wave propagation. Doppler effect. Basic antenna types and special antennas in navigational aids. Electronic power supplies. *Prereq.* 03.309.

**96.322 Avionics II** (2 cl., 2 q.h.)

Principles of amplitude and frequency modulation and demodulation. Principles of servo-mechanisms. Principles of radar. *Prereq.* 03.321.

**96.323 Avionics III** (2 cl., 2 q.h.)

A study of characteristics and operation of typical aircraft navigation systems currently being used in modern aircraft. The course covers remote compass systems, ADF, Omni and ILS equipment.

**\*96.331 Primary Flight I** (2 lab., 1½ q.h.)

Elements of flight principles (pre-flight operations), operation of aircraft systems. Taxi operations and ground performance. Basic flight maneuvers. Take-offs and landings. *Prereq.* Class I or II, medical certificate.

**\*96.332 Primary Flight II** (2 lab., 1½ q.h.)

Review of basic flight maneuvers. Advanced maneuvers and stall procedures. Short field take-offs and landings. Power approaches and landing under varying conditions. Emergency operation of aircraft equipment. *Prereq.* 96.331. *Student must have a current endorsement for solo flight.*

**\*96.333 Primary Flight III** (2 lab., 1½ q.h.)

Cross country flight planning and flight. Lost procedures and related emergencies. Use of radio and navigation equipment under V.F.R. (visual flight rules). Control of aircraft by reference to flight instruments only. Private license qualifications complete. *Prereq.* 96.332. *Student must have a current endorsement for solo cross country flight.*

**\*96.341 Commercial Flight I** (2 lab., 1½ q.h.)

Review of all primary flight maneuvers. Advanced maneuvers. Precision take-offs and landings, cross wind techniques. *Prereq.* 96.333.

**\*96.342 Commercial Flight II** (2 lab., 1½ q.h.)

Precision flight maneuvers — spirals about a point. Shallow and steep onpylon eights, 720° steep power turns. Solo practice. *Prereq.* 96.341.

**\*96.343 Commercial Flight III** (2 lab., 1½ q.h.)

Continuation of precision maneuvers: lazy eights, chandelles, maneuvers at minimal controllable airspeed. Continued related simulator practice. Night flying. Basic instrument flying. *Prereq.* 96.342.

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\*See Flight Tuition Schedule, page 45.

**\*96.344 Commercial Flight IV** (2 lab., 1½ q.h.)

Stalls from all normally anticipated flight altitudes with and without power. Simulated emergency procedures and forced landings. Basic instrument flying. *Prereq.* 96.343.

**\*96.345 Commercial Flight V** (2 lab., 1½ q.h.)

Advanced cross country flight planning and navigation. Advanced radio communications and traffic procedures. Review of all maneuvers and procedures. (Certification F.A.A.) *Prereq.* 96.344.

**\*96.351 Instructional Flight I** (2 lab., 1½ q.h.)

Fundamentals of flight instruction. Development of student-instructor relationship and rapport. Teaching procedures in flight training. Instructor responsibilities and record maintenance. Instructor flight demonstrations. Qualification and certification by F.A.A. *Prereq.* 96.345 & 96.354 or concurrently.

**\*96.352 Instructional Flight II** (2 lab., 1½ q.h.)

Continuation of fundamentals of instruction, flight training procedures, student instructor relationship, review of all maneuvers and flight demonstrations. Certification by F.A.A. *Prereq.* 96.351.

**96.354 Principles of Flight Instruction** (2 cl., 2 q.h.)

Fundamentals and Principles of Instructing, Learning Concepts of Teacher Student Communications, Use of special flight teaching aids, and training procedures. *Prereq.* 96.345 or equivalent test.

**\*96.355 Instrument Instructor Flight A** (2 lab., 2 q.h.)

Fundamentals and procedures for teaching operating limitations of all instruments, control of rate of climb and descent to pre-determine altitudes, procedures for coping with unusual altitudes and critical situations.

**\*96.356 Instrument Instructor Flight B** (2 lab., 2 q.h.)

Principles and procedures of teaching methods in instrument flight planning and enroute weather analysis, radio communication and enroute navigation and orientation. Oral exam and flight test preparation.

**96.357 Multi-Engine Flight** (2 lab. 1½ q.h.)

Preparation for a F.A.A. multi-engine rating test which includes an oral exam on the aircraft documents performance, and operating characteristics. Multi-engine flight instruction on basic piloting techniques and emergency procedures.

**\*96.361 Instrument Flight I** (2 lab., 1½ q.h.)

Instrument flight planning, preparing and filing. Aircraft performance (range and fuel requirements). Required instruments and their proper use. Basic instrument flying, needle ball and airspeed only. Instrument use in turns, climbs, descents, stalls and approach speeds. Recovery from unusual altitudes. Airwork using all altitudes instruments. *Prereq.* 96.345.

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\*See Flight Tuition Schedule, page 45.

**\*96.362 Instrument Flight II** (2 lab., 1½ q.h.)

Radio navigation while flying on instruments. Use of L.F. (low frequency), omni-range, or A.D.F. (automatic direction finder). Advanced radio communications. Instrument approaches, holding procedures, missed approach procedures, emergencies (radio and instrument malfunctions). Air traffic control instructions and procedure. Rating by F.A.A. *Prereq.* 96.361.

**\*96.363 Instrument Flight III** (2 lab. 1½ q.h.)

Advanced radio communication and navigation flight procedures. Cross country radio navigation and approach procedures. Preparation for oral and flight exams.

**96.370 Air Cargo Practices A** (3 cl., 3 q.h.)

Sturdy of airline and air freight forward cargo practices with emphasis on regulation, economics, marketing, and handling and organizational aspects.

**96.371 Air Cargo Practices B** (3 cl., 3 q.h.)

A continuation through case studies of air cargo operations.

**96.372 Airline Traffic and Sales A** (3 cl., 3 q.h.)

Functions of the traffic & sales department, relationship between the travel agencies and the airlines, relationships with other carriers, reservations and the procedures involved in the transportation of one passenger of NCA and another carrier, airlines promotion, the reservation agent and training.

**96.373 Airline Traffic and Sales B** (3 cl., 3 q.h.)

Tariffs and schedules with an explanation of how flight times are established, flight frequencies, new routes, and the establishment of ticket fares. Aspects of cargo and charters.

**96.376 General Aviation Operations** (3 cl., 3 q.h.)

A presentation of the major functions of airport management; organization, zoning, adequacy, financing, revenues and expenses, evaluation and safety. A study of the Airport and its socioeconomic effect on the community. No Prerequisite.

**96.378 Air Traffic Control Systems A** (3 cl., 3 q.h.)

Survey of the total aero-space system and management. Air traffic administrative coordination. Regional responsibilities. NAFEC Organization of Center, Tower, and Station.

**96.384 Aviation History** (3 cl., 3 q.h.)

Historical survey of efforts in manned flight, aircraft development, pioneers in flight, general aviation, military and commercial aspects of flight and effects on modern civilization. *Prereq.* none.

**\*96.390 Pilot Refresher** (2 lab., 1½ q.h.)

This course consists of 24 hours of concentrated instruction and evaluation of pilot proficiency in advanced instrument flying and instructional flight procedures. It involves simulator flight, aircraft flight, ground instruction and the updating of current procedures in flight instruction and flight planning procedures. *Prereq.* special permission of flight director.

**96.391 Air Science & Navigation A** (3 cl., 3 q.h.)

Aircraft structures and components aerodynamic forces, airfoil terminology — lift, and drag coefficient, boundary layer problems and control, Reynolds Number and Scale Effect. Earth in space, latitude, longitude, properties and components of the atmosphere, map projections, dead reckoning, reciprocating engine theory, gas turbine engine theory, planform effects, aircraft weight and balance. *Prereq.* 96.345 or equivalent test.

**96.392 Air Science & Navigation B** (3 cl., 3 q.h.)

Radio navigation, VOR, ADF, DME and TACAN, federal air regulations, airplane performance (climb, range, altitude, takeoff, and landing), aircraft propeller theory and operation, specific aircraft substructures (landing gear et. al.), advanced DR navigation problems (radius of action, unknown wind), general review. *Prereq.* 96.391.

**96.393 Advanced Air Science & Navigation A** (3 cl., 3 q.h.)

Supersonic aerodynamics physiologic factors of flight, instrument flight charts, IFR planning, instrument flight rules, static and dynamic axial stability of aircraft, control movements and forces, stability problems. *Prereq.* 96.392.

**96.394 Advanced Air Science and Navigation B** (3 cl., 3 q.h.)

Spins and spin recoveries, flying high performance aircraft, area charts, arrival and departure, SID charts, clearance notation, aircraft performance, applications of aerodynamics to specific problems of flight, helicopter stability, structural strength limitations, doppler radar, precision approach radar & airport surveillance radar, loran, consolan, pressure pattern flight. *Prereq.* 96.393.

**96.395 Meteorology & Climatology A** (3 cl., 3 q.h.)

A survey of the principles of meteorology and structure of the atmosphere. Meteorological instruments and observations. Weather map interpretation and common aviation weather teletype codes. *Prereq.* 11.392.

**96.396 Meteorology & Climatology B** (3 cl., 3 q.h.)

Physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations. Climate causes and effects. Climatology of several regions of the world. Application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq.* 96.396.

**96.397 Avionics A** (3 cl., 3 q.h.)

Radio wave propagation. Doppler effect. Basic antenna types and special antennas in navigational aids. Electronic power supplies. Principles of amplitude and frequency modulation and demodulation. *Prereq.* 03.395.

**96.398 Avionics B** (3 cl., 3 q.h.)

Principles of servo-mechanisms. Principles of radar. A study of characteristics and operation of typical aircraft navigation systems currently being used in modern aircraft. The course covers remote compass systems, ADF, Omni and ILS equipment. *Prereq.* 96.397.

# the lincoln college faculty

THE STRENGTH of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists is ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants, constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise, and assist with the administration of courses and programs.

## THE FACULTY

The following is an alphabetical list of the faculty of Lincoln College, degrees earned (year of appointment), professional affiliation and titles and Lincoln College department are listed.

- Charles D. Aaronson, B.S., M.S.  
Electrical Engineering Manager for R & D.  
*Electrical Engineering Technology (1964)*
- H. David Ahlberg, A.B., Ph.D.  
Assistant Professor of Biology, Northeastern University.  
*Biology (1969)*
- Frank P. Alberti, Jr., B.S., M.S.  
Instructor, Northeastern University.  
*Mechanical Engineering Technology (1968)*
- Arnold W. Almquist, Jr., B.S., M.Ed.  
Administrative Assistant to Director of Math, Needham High School.  
*Mathematics (1967)*
- George H. Anderson, Commercial Art Diploma  
Professional Artist; Free Lance Technical Illustrator.  
*Engineering Graphics and Computation (1956)*
- Will C. Anderson, B.S., M.S.  
Program Engineer, Raytheon Corporation.  
*Engineering Graphics and Computation (1968)*
- Robert B. Angus, Jr., B.S., M.S., P.E. (Mass.)  
Senior Engineering Specialist, Communications Systems Division, Sylvania Electric Products.  
*Electrical Engineering Technology (1948)*
- Roger M. Antoine, Baccalaureate, Licence es Science  
Diplomas of Meteorology, and Engineering, Marseille University; Associate Professor of Mathematics, Northeastern University.  
*Mathematics (1955)*
- Victor S. Aramati, M.S., M.E.  
Bell Telephone Laboratories.  
*Mechanical Engineering Technology (1970)*
- Louis E. Ashley, A.B., M.Ed.  
Senior Consulting Engineer, Avco Corporation, Systems Division.  
*Mechanical Engineering Technology (1966)*
- Robert J. Averill, B.S., M.S.  
Cambridge Electron Accelerator, Harvard University.  
*Course Consultant for Electrical Engineering Technology (1957)*
- Warren F. Averill, B.S., M.S.  
Research Chemist, Ionics, Inc.; Master, Boston Latin School.  
*Chemistry (1967)*
- Russell H. Babcock, S.B., S.M., P.E. (Mass., Maine, N.H., R.I., Vt.)  
Diplomate, American Academy of Environmental Engineers;  
Chief Water Resources Engineer, Charles A. Maguire & Associates, Inc.  
*Civil Engineering Technology (1954)*
- T. A. Balasubramaniam, B.E., M.Sc.  
A.M.I.E. (India)  
*Mechanical Engineering (1970)*

- John C. Balsavich  
Laboratory Supervisor, Electrical Engineering, Northeastern University.  
*Electrical Engineering Technology* (1957)
- Joseph E. Barbeau, B.S., M.Ed.  
Associate Professor of Cooperative Education, Northeastern University  
*Chemistry* (1966)
- Eugene R. Bartlett, B.S.E.E., M.S.E.E., P.E. (Mass.)  
Research Associate, Northeastern University.  
*Electrical Engineering Technology* (1958)
- Robert T. Bateman, B.S., M.A.  
Head of Mathematics Dept., Wellesley Senior High School.  
*Mathematics* (1957)
- Samuel W. Bartol, B.A.  
CFI Multiengine & Instrument Ratings, Wiggins Airways.  
*Aviation* (1969)
- Adolph Baumann, B.S.  
Lecturer, Electronics Engineering, Northeastern University.  
*Electrical Engineering Technology* (1955)
- Sheldon Beaver, B.S., M.Ed.  
Consulting Geometrician.  
*Engineering Graphics and Computation* (1969)
- Robert C. Beck, B.S., M.E.  
Teaching Assistant at Northeastern University.  
*Mechanical Engineering* (1969)
- Fred E. Bellows, Jr., B.S., M.Ed.  
Principal, East Elementary School, Sharon.  
*Aviation Technology* (1968)
- Walter E. Benulis, B.S., M.S.  
Research Associate, M.E. Department, Northeastern University.  
*Mechanical Engineering Technology* (1969)
- Matteo P. Berardi, B.S., M.S.  
Consultant.  
*Mechanical Engineering Technology* (1960)
- Maureen P. Berggren, B.S.  
Instructor of Mathematics, Quincy High School.  
*Mathematics* (1965)
- Alfred L. Birch, B.S.E.E., P.E. (Mass.)  
Dept. Head, Development Engineering, Western Electric Co.  
*Electrical Engineering Technology* (1965)
- Ralph S. Blanchard, Jr., B.S., M.S., P.E. (Mass.)  
Associate Professor Mechanical Engineering, Northeastern University.  
*Mechanical Engineering Technology* (1950)
- Emmanuel E. Bliamptis, B.S., S.M., M.A., P.E. (Mass.)  
Research Physicist, Air Force Cambridge Research Labs.  
*Physics* (1965)
- Joseph I. Bluhm, S.B., M.S., P.E. (Mass., Ohio)  
Chief Theoretical and Applied Mechanics Research Laboratory,  
Army Materials and Mechanics Research Center.  
*Mechanical Engineering Technology* (1966)
- Sidney Bluhm, A.B., Ed.M., A.M.  
Head, Science Department, Boston Technical High School.  
*Physics* (1965)



Edward Bobroff, B.M.E., P.E. (Mass.)

Chief Engineer, Combat Systems, Boston Naval Shipyard.  
*Course Consultant for Mathematics (1946)*

Fletcher S. Boig, B.S., M.S., Ed.M.

Associate Professor of Chemistry, Northeastern University.  
*Program Consultant for Chemistry (1945)*

Edward J. Booth, A.B., Ed.M.

Associate Professor of Mathematics, Northeastern University.  
*Mathematics (1956)*

Horst Borberek, B.S., P.E. (Mass., Conn., N.H.)

Principal Engineer, Howard, Needles, Tammen & Bergendoff, Consulting Engineers.  
*Civil Engineering Technology (1968)*

Roland J. Boucher, B.A., M.S.

Research Physicist, Air Force Cambridge Research Lab.  
*Aviation Technology (1968)*

Kenneth E. Bourque, B.S., M.S.

Senior Electronics Engineer, Sanders Associates, Inc.  
*Electrical Engineering Technology (1959)*

Eugene G. Branca, S.B., S.M.

Assistant Headmaster, Hyde Park High School.  
*Mathematics (1946)*

Donald H. Breslow, S.B., M.S.

Director of Engineering, Wayne-George, Division Itek Corporation.  
*Electrical Engineering Technology (1959)*

Alfred E. Bresnahan, B.S., M.A.

Chairman, Mathematics Dept., Lynn English High School.  
*Mathematics (1967)*

Karl L. Briggs, B.S., M.A.

Former Head of Mathematics Dept., Quincy High School.  
*Mathematics (1957)*

Donald C. Brock, B.S., M.S.

Mathematics Instructor, Needham High School.  
*Mathematics (1965)*

Bruno Brodfeld, B.S.C.E. (Mass., La.)

P.E. Chief Environmental Engineer, Stone & Webster Engineering Corporation.  
*Civil Engineering Technology (1965)*

Suzanne C. Brooks, B.S., M.Ed.

Mathematics Teacher, Brookline High School.  
*Mathematics (1968)*

Franklyn K. Brown, B.S.Ed., M.Ed.

Associate Professor, Graphic Science, Northeastern University.  
*Course Consultant for Engineering Graphics and Computation (1955)*

William A. Brown, B.S.E.E., M.S.E.E., J.D.

Assistant Professor of Law, Suffolk Law School.  
*Electrical Engineering Technology (1965)*

Jeffrey L. Bruce, B.S., M.A.

Instructor, Dover-Sherborn Regional High School.  
*Mathematics (1969)*

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William O. Bruehl, B.S.

Associate Professor, Mechanical Engineering, Northeastern University.  
*Course Consultant for Mechanical Engineering Technology (1956)*

Ralph A. Buonopane, B.S.Ch.E., M.S.Ch.E., Ph.D.

Assistant Professor, Chemical Engineering, Northeastern University.  
*Chemistry (1964)*

Morris H. Burakoff, B.S., P.E. (Mass.)

Department Chief, Western Electric Company.  
*Electrical Engineering Technology (1957)*

George Burdick, A.B., P.E. (Mass.)

Hudson Institute, Hudson, Mass.  
*Electrical Engineering Technology (1950)*

Donald Burgess, A.B., M.Ed.

Head of Department, Boston English High School.  
*Mathematics (1967)*

Frederick J. Bush, M.E., M.S.

Senior Project Engineer, Polaroid Corporation.  
*Mathematics (1966)*

Steven Butcher, Jr., S.B., M.S.

Technical Staff, The Mitre Corporation.  
*Electrical Engineering Technology (1967)*

Paul F. Butler, B.S., M.S.Ed., M.S.Math.

Mathematics Teacher, Needham Public Schools.  
*Mathematics (1967)*

Daniel D. Button, B.Sc., Ph.D.

Research Associate, American Ceramic Society, National Institute of  
Ceramic Engineers. MSPE.  
*Mechanical Engineering Technology (1969)*

William D. Byard, B.S., M.S.

Experimental Biologist, Commonwealth of Massachusetts.  
*Biology (1966)*

Gregory J. Cahill, B.S.M.E., M.S.M.E.

A.S.M.E.  
*Mechanical Engineering Technology*

Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Mass.)

Associate Professor of Civil Engineering, Northeastern University.  
*Program Consultant for Civil Engineering Technology (1962)*

John J. Callahan, B.S., M.Ed., M.A.

Assistant Professor, Boston State College.  
*Mathematics (1969)*

Robert E. Cameron, B.S., P.E. (Mass., N.H.), R.L.S. (Mass., Maine, Conn., R.I., Vt., & N.H.)

Owner and Manager, R. E. Cameron & Associates, Civil Engineers & Land Surveyors.  
*Civil Engineering Technology (1956)*

Frank R. Cangiano, B.S., Ed.M.

Instructor in Science and Mathematics, Medford High School.  
*Mathematics (1957)*

Michael A. Cangiano, S.B., Ed.M.

Assistant Headmaster, Medford High School.  
*Mathematics (1946)*

Richard I. Carter, B.S., M.S., P.E. (Mass.)

Associate Professor, Electrical Engineering and Director of Computation Center,  
Northeastern University.

*Engineering Graphics and Computation (1955)*

Walter J. Casey, A.B., M.Ed., M.A.T.

Head of Department, Brighton High School.

*Mathematics (1955)*

Walter J. Charow, B.S.E.E., M.S.E.E., P.E. (Mass.)

Branch Chief, Avionics, Electronics System Div., U.S.A.F.

*Electrical Engineering Technology (1955)*

Bruce B. Claflin, A.B., M.S.

Associate Professor of Mathematics, Northeastern University.

*Course Consultant for Mathematics (1964)*

Phillip J. Clang, B.S., P.E. (Mass., Pa.)

Principal Engineer, Jackson & Moreland, Div. of United Engineers & Constructors, Inc.

*Mechanical Engineering Technology (1957)*

Laurence F. Cleveland, B.S., M.S., P.E. (Mass.)

Professor, Electrical Engineering, Northeastern University.

*Program Consultant for Electrical Engineering Technology (1931)*

Matthew H. Cohn, B.S.

Senior Programmer, Raytheon Company.

*Engineering Graphics and Computation (1969)*

Joseph C. Colantuno, B.S.E.E.

*Electrical Engineering Technology (1970)*

William F. Colby, B.S.E.E.

Engineer, Harvard University, CEA.

*Electrical Engineering Technology (1970)*

Leonard M. Conlin, A.B., Ed.M.

Mathematics Teacher, Framingham North High School.

*Mathematics (1967)*

Joseph V. Connolly, B.S., M.Ed.

Head of Department, Boston Latin School.

*Physics (1965)*

Jerome J. Connor, Jr., S.B., S.M., Sc.D.

Associate Professor, Civil Engineering, Massachusetts Institute of Technology.

*Mechanical Engineering Technology (1957)*

Roger T. Connor, A.B., M.Ed.

Head Master, Jamaica Plain High School.

*Mathematics (1953)*

Robert J. Connors, B.S.

Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.

*Electrical Engineering Technology (1947)*

Edward M. Cook, A.B., A.M.

Professor of Mathematics, Northeastern University.

*Program Consultant for Mathematics (1941)*

Joseph Z. Cooper, B.S.E.

Principal Engineer, Raytheon Company.

*Engineering Graphics and Computation (1967)*

Robert C. Copeland, B.S.E.E., S.M.

Staff Meteorologist, WHDH-TV.

*Aviation Technology (1968)*

James B. Corscadden, B.S.Ed., M.Ed., A.M.T.  
Instructor, Boston English High School.  
*Mathematics (1967)*

Richard E. Cox, B.S.M.E., M.S., P.E. (Mass.)  
Professional Engineer, General Electric Company.  
*Mechanical Engineering Technology (1967)*

David C. Crockett, B.S., M.S.  
Consultant.  
*Mechanical Engineering Technology*

Thomas J. Crowley, S.B., M.S.  
Research Associate, Harvard University School of Public Health.  
*Mechanical Engineering Technology (1966)*

Dominic J. Cucinotti, B.S., M.S.  
Structural Engineer, Computer Applications, Stone & Webster Engineering Corporation.  
*Engineering Graphics and Computation (1966)*

Herbert R. Davenport, B.S.  
Quality Control Engineer, General Radio Company.  
*Electrical Engineering Technology (1948)*

Warren C. Dean, A.B., M.A.  
Associate Professor of Mathematics, Northeastern University.  
*Course Consultant for Mathematics (1941)*

A. Dean DeMarre, A.E., B.S., Sc.D.  
Consulting Editor, Medical Electronics & Data.  
*Electrical Engineering Technology (1967)*

Thomas R. Deveney, B.S.  
Instructor in Mathematics, Boston Latin School.  
*Mathematics (1965)*

Douglas H. Diamond, B.E.E.  
Systems Engineer, TRW, Inc.  
*Mathematics (1968)*

Giles C. Dilg, B.S.E.E., M.S.E.E.  
Senior Project Engineer, Raytheon Corporation.  
*Engineering Graphics and Computation (1966)*

Francis J. DiSabatino, B.S., Ed.M.  
Chemistry Instructor, Quincy High School, Quincy Jr. College.  
*Chemistry (1965)*

Mark Domaszewicz, B.E.E., M.S.E.E.  
Senior Engineer, Raytheon Company.  
*Electrical Engineering Technology*

Leonard F. Dow, B.S.E.E., M.S.  
IEE, Boston Chapter Power Group.  
*Electrical Engineering Technology*

Paul A. Dunkerley, B.S., S.M., P.E. (Mass.)  
Associate Professor of Civil Engineering, Tufts University.  
*Civil Engineering Technology (1968)*

Robert A. Dunlea, Jr., B.S.  
Engineer, New England Power Service Co.  
*Mathematics (1969)*

Robert F. Dunning, B.S., M.S.  
Chief Sanitary Engineer, Anderson-Nichols & Co., Inc.  
*Civil Engineering Technology (1969)*

- Philip W. Dunphy, B.Sc., M.Ed.  
Associate Professor of Cooperative Education, Northeastern University.  
*Academic Counsellor (1967)*
- William V. Durante, B.S., M.Ed., M.A.  
Head of Mathematics Dept., Boston Latin School.  
*Mathematics (1964)*
- Jon A. Ebacher, B.S.M.E., M.S.M.E.  
Development Engineer, General Electric Company.  
*Mechanical Engineering Technology*
- Henry B. Eden, Diploma-Museum of Fine Arts  
Executive Vice President, Anco Technical Services, Inc.  
*Engineering Graphics and Computation (1957)*
- Herbert E. Engel, B.S., M.S.  
Technical Staff, Mitre Corporation  
*Electrical Engineering Technology (1958)*
- Charles P. Engelhardt, B.S., M.Arch.  
Architect, U.S. Post Office Department Regional Engineers.  
*Engineering Graphics and Computation (1942)*
- Adolf J. Erikson, B.B.A., M.B.A., P.E. (Mass.)  
President, A.E. Engineering Corporation.  
*Engineering Graphics and Computation (1966)*
- George A. Fargo, B.S., M.S.  
Mathematics Teacher, Framingham North High School.  
*Mathematics (1967)*
- Martin J. Feeney, S.B., Ed.M.  
Principal, Henry Grew District, Boston Public Schools.  
*Mathematics (1957)*
- Warren G. Ferzoco, A.E., B.B.A., M.Ed.  
Instructor, Rindge Technical High School.  
*Engineering Graphics and Computation (1966)*
- Charles Field, B.S., M.Ed.  
Professor of Cooperative Education, Northeastern University.  
*Academic Counsellor (1967)*
- William D. Finan, A.B., M.A.  
Reading Director, Needham Public Schools.  
*Course Consultant for Mathematics (1946)*
- Louis A. Fiore, A.E., B.B.A.  
Mech. Engineer, Design Checker, American Science and Engineering, Inc.  
*Engineering Graphics and Computation (1956)*
- A. Ralph Fiore, Jr., B.S.E.E., M.S. Eng. Mgt.  
*Computation & Graphics (1969)*
- Thomas M. Fitzgerald, Sc.B., Sc.M., Ph.D.  
Naval Underwater Systems Center, Newport, R. I.  
*Physics (1967)*
- Robert F. Ford, B.S.E.E., M.S.E.E.  
Applications Engineering, Spiras Systems Inc.  
*Electrical Engineering Technology (1962)*
- Eugene G. Fortin, B.A.  
Senior Member, Technical Staff, RCA Corporation.  
*Chemistry (1958)*

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- Earlwood T. Fortini, A.B., P.E. (Mass.)  
Staff Engineer, Compugraphic Corporation.  
*Mechanical Engineering Technology (1957)*
- John L. Freedman, B.S.  
Instructor, Bryant & Stratton and Northeastern University.  
*Course Consultant for Electrical Engineering Technology (1949)*
- John Gaffney, B.S., M.S.  
Physicist, Raytheon Corporation.  
*Physics (1968)*
- Jerry M. Galatis, B.S.(2), M.Ed., O.D.  
Nuclear Research, Controls for Radiation.  
*Physics (1965)*
- Peter D. Gianino, B.S., M.S.  
Research Physicist, Air Force Cambridge Research Labs.  
*Mathematics (1965)*
- Charles J. Glassbrenner, B.S., M.S., Ph.D.  
Associate Professor, Worcester State College.  
*Physics (1967)*
- Sheldon L. Glickler, B.S., M.S.  
Avco Everett Research Laboratory, Senior Scientist.  
*Civil Engineering Technology (1969)*
- David Goldberg, B.S., M.S.  
Senior Engineer, Sylvania Electric Products, Inc.  
*Engineering Graphics and Computation (1969)*
- Leonard M. Goodman, S.B., S.M., E.E.  
Staff Member, Lincoln Laboratory, Mass. Institute of Technology.  
*Electrical Engineering Technology (1969)*
- Norman Gordon, B.A., M.Ed., C.A.G.S.  
President, Eduquip Inc.  
*Physics (1967)*
- Arlene G. Gough, A.B., Med. Tech.  
Registered Medical Technologist.  
*Biology (1969)*
- Ernest C. Greer, B.S.M.E., M.S.M.E.  
*Mechanical Engineering Technology (1970)*
- Arthur F. Gustus, B.S., M.Ed., A.G.S.  
Assistant Director of Science, Boston Public Schools.  
*Course Consultant for Physics (1963)*
- Joseph L. Hallett, S.B.  
Section Head, Sylvania Electric Products, Inc.  
*Electrical Engineering Technology (1958)*
- Charles E. Hamilton  
Flight School Director, Wiggins Airways, Inc.  
*Course Consultant for Aviation Technology (1969)*
- Frank A. Hamilton, A.E.  
Structural Engineer, Jackson & Moreland Div. of United Engineers & Constructors, Inc.  
*Civil Engineering Technology (1947)*
- Francis R. Hankard, S.B., M.A.  
Senior Chemist, State Police Laboratories.  
*Course Consultant for Physics (1946)*

- Edwin V. Harrington, Jr., B.S., M.S.  
Project Officer, A.F. Cambridge Research Laboratory  
*Mathematics (1969)*
- George C. Harrison, B.S., M.S.  
Senior Electronic Engineer, Polaroid Corporation.  
*Electrical Engineering Technology (1962)*
- Walter Hauser, B.S., Ph.D.  
Professor of Physics, Northeastern University.  
*Mathematics (1969)*
- William J. Hennessy, B.S., M.B.A.  
Lieutenant Commander, U.S. Navy (Ret.).  
*Mathematics (1969)*
- Walter D. Herrick, B.S., M.S.C.E.  
Instructor, Basic Engineering, Northeastern University.  
*Engineering Graphics and Computation (1968)*
- Patricia C. Hertel, A.B., M.A.  
Formerly Staff Biochemist, Mass. Institute of Technology.  
*Chemistry (1968)*
- Joseph I. Herzlinger, B.S., M.S., P.E. (New Jersey)  
Leader Technical Staff, Aerospace Systems Division, RCA.  
*Mechanical Engineering Technology (1967)*
- Harry E. Hewes, B.S.B.A., M.Ed.  
Teacher, Boston Latin School.  
*Mathematics (1967)*
- Lewis H. Holzman, B.S.C.E., S.M.C.E.  
*Engineering Graphics and Computation (1966)*
- Arthur F. Howe, B.S., M.S., Ph.D.  
Executive Director, Sepac.  
*Chemistry (1965)*
- George K. Howe, B.S.E.E., M.Ed.  
Associate Professor Cooperative Education, Northeastern University.  
*Academic Counselor (1970)*
- Richard A. Hultin, B.S., M.S., P.E. (New York)  
Group Supervisor, Raytheon Company.  
*Mechanical Engineering Technology (1967)*
- Everett L. Hume, B.S., M.S., P.E. (Mass.)  
Staff, M.I.T., Draper Laboratory.  
*Civil Engineering Technology (1950)*
- Mervyn Israel, B.S., M.S., Ph.D.  
Senior Staff, The Children's Cancer Research Foundation; Research Associate, Children's Hospital Medical Center; Associate in Biological Chemistry, Harvard Medical School.  
*Chemistry (1964)*
- Charles E. Jacob, B.S.E.E., M.S.Ed.  
Master, Boston Latin School.  
*Physics (1957)*
- Reza Jameh-Naini, B.S., M.E.  
*Mechanical Engineering Technology (1968)*
- Perry G. Jameson, B.S., M.Ed.  
Boston Latin School.  
*Mathematics (1965)*

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Arthur W. John, B.S.E.E., M.S.

Lecturer, Northeastern University.

*Radiologic Technology and Commercial Aviation Technology (1968)*

Eugene F. Joyce

Technician, Electrical Engineering Dept., Northeastern University, U.S. Army Retired.

*Electrical Engineering Technology (1963)*

John Kaczorowski, Jr., B.S.E.E., M.S.E.E.

Instructor, Electrical Engineering, Northeastern University.

*Electrical Engineering Technology (1970)*

Britta L. Karlsson, M.T. (A.S.C.P.), B.S., M.S.

Assistant Professor in Medical Technology, Biology Dept., Northeastern University.

*Course Consultant for Medical Technology (1965)*

Leon Katler, Certificate P.E. (Mass.)

Structural Engineer, Stone & Webster Engineering Corporation.

*Civil Engineering Technology (1963)*

Louis Katona, B.C.E., M.C.E., P.E. (Mass. & N.Y.)

Hydraulic and Sanitary Engineer, The Badger Co.

*Civil Engineering Technology (1959)*

Charles W. Kaufman, B.S.Ed., Ed.M., M.N.S.

Guidance Counselor, Girls Latin School.

*Physics (1958)*

Sidney W. Kaye, B.Sc.

Member of Technical Staff, T.R.W., Inc.

*Mathematics (1967)*

Gary M. Keighley, B.S.

Flight and Ground Instructor, Wiggins Airways.

*Aviation Technology (1969)*

John T. Keiran, A.B., A.M.

Chairman of Mathematics Department, Dorchester High School.

*Mathematics (1957)*

George F. Kent, B.S., M.S., P.E. (Mass.)

Group Supervisor, Babcock & Wilcox Co.

*Mechanical Engineering Technology (1966)*

Nicholas P. Kernweis, B.E.E., M.S.

Research Physicist, Air Force Cambridge Research Lab.

*Electrical Engineering Technology (1957)*

A. Karim Khudairi, B.S., Ph.D.

Professor of Biology, Northeastern University.

*Biology (1968)*

Bernard J. Kiley, B.E., M.E., P.E. (N.H.)

Chief Structural Engineer, Anderson-Nichols & Company, Inc.

*Mechanical Engineering Technology (1958)*

Mark M. Kiley, B.E., M.E., P.E. (Mass., R.I., La.)

President, Mark M. Kiley Associates, Inc.

*Mechanical Engineering Technology (1955)*

Philip D. Kingman, B.S.C.E., LL.B., P.E. (Mass., N.H.), R.L.S. (Mass., Me., N.H.)

Real Estate Engineer, Public Service Company of New Hampshire.

*Civil Engineering Technology (1964)*

John J. Klein, B.S., M.S.

Leader (Television and Displays), Electro-optics Section, Aerospace Systems Division,  
Radio Corporation of America.

*Electrical Engineering Technology (1950)*



- Richard W. Kopka, B.S.E.E., M.S.E.E.  
Captain, USAF, Electrical Engineer, AF Cambridge Research Labs.  
*Electrical Engineering and Computation (1967)*
- Paul A. Kossey, B.S.E.E., M.S.E.E., Ph.D.  
Captain, U.S. Air Force, Research Engineer, Air Force Cambridge Research Center.  
*Electrical Engineering Technology, Physics (1967)*
- Borah L. Kreimer, B.S., Ed.M.  
Associate Professor Graphic Science, Northeastern University.  
*Engineering Graphics and Computation (1954)*
- Malcolm D. Kruger, B.S., M.S.  
Research Engineer, Sylvania Electronic Systems, Inc.  
*Course Consultant for Engineering Graphics and Computation (1967)*
- Juris Krumins, B.S., M.S.  
Research Assistant, Northeastern University.  
*Mechanical Engineering Technology (1966)*
- In-Tin Timothy Kuo, B.S.  
*Mechanical Engineering Technology (1970)*
- Horatio W. Lamson, B.S., M.A., P.E. (Mass.)  
Research Engineer, Emeritus, General Radio Company.  
*Electrical Engineering Technology (1945)*
- Herbert C. Lang, B.S., P.E. (Mass.)  
Manager of Employment and Training, Masoneilan International, Inc.  
*Engineering Graphics and Computation (1936)*
- Robert S. Lang, B.S., Ed.M.  
Associate Professor, Graphic Science, Northeastern University.  
*Program Consultant for Engineering Graphics and Computation (1955)*
- Peter B. Lanzillotti, B.S.E.E., M.S.E.E.  
*Electrical Engineering Technology (1970)*
- Aristotle T. Laskaris, A.B., M.S.  
Section Chief, Avco Corporation.  
*Chemistry (1960)*
- Clarence E. LeBell, P.E. (Mass.)  
Mechanical and Electrical Engineering Senior Designer, Aircraft Gas Turbine Division, General Electric Company.  
*Engineering Graphics and Computation (1955)*
- A. Richard LeSchack, A.B., A.M.  
Staff Mathematician, IBM (Federal Systems Division).  
*Mathematics (1968)*
- Alvin J. Lesieur, B.S., M.S.  
Eugene Engineering Co.  
*Engineering Graphics and Computation (1965)*
- Andrew S. Levine, A.B., B.S., M.S.  
Instructor, Mechanical Engineering, Northeastern University.  
*Mechanical Engineering Technology (1968)*
- Edward T. Lewis, B.S., M.E.E.  
Staff Member, Sperry Rand Research Center.  
*Physics (1967)*
- Sandra M. Lictor, B.S.Ed., M.Ed.  
Instructor, Lynn English High School.  
*Mathematics (1967)*

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- Demetre P. Ligor, B.S.E.E., P.E. (Mass.)  
President, Applied Measurements, Inc.  
*Course Consultant for Physics (1959)*
- Warren J. Little, B.S., M.S.  
Principal Engineer, Mass. Institute of Technology, C. S. Draper Laboratory.  
*Physics (1967)*
- Andrew G. Lofgren, A.A., Ed.M., P.E. (Mass.)  
Design Engineer, Charles Stark Draper Laboratory, M.I.T.  
*Mechanical Engineering Technology (1946)*
- Roger G. Long, A.E., B.B.A., P.E. (Mass.)  
Staff, Arthur D. Little, Inc.  
*Electrical Engineering Technology (1952)*
- Spencer P. Lookner, B.S.E.E., M.S.E.E., M.S.I.E.  
Supervisor, Quality Control Engineering and Calibration, Analog Devices, Inc.  
*Mathematics (1967)*
- Kenneth A. Lucas, B.S., M.Ed., P.E. (Mass., Conn.), R.L.S. (Mass., Conn., Maine, N.H.)  
Chief of Survey, Whitman & Howard, Inc.  
*Civil Engineering Technology (1950)*
- John F. Lutkevich, A.E., B.B.A.  
Senior Engineering, Sylvania Electric Products, Inc.  
*Engineering Graphics and Computation (1956)*
- Andrew C. MacAulay, Jr., B.S., M.S.  
Director, Core Laboratory, New England Medical Center.  
*Chemistry (1960)*
- George H. MacMaster, B.S., M.S., P.E. (Mass.)  
Research Engineer, Raytheon Company.  
*Electrical Engineering Technology (1968)*
- Jueson Maeng, B.S., M.S.  
Teaching Assistant, Biology Department, Northeastern University.  
*Biology (1969)*
- Albert C. Mahagan, B.S.  
Flight and Ground School Instructor, Wiggins Airways, Inc.  
*Aviation Technology (1968)*
- Alvin Mandell, B.E.E., M.S.E.E., P.E. (Mass.)  
Program Management, Raytheon Missile Systems Division.  
*Electrical Engineering Technology (1950)*
- Jack I. Mann, B.S.C.E., M.S., P.E. (Mass., Vt.)  
Principal, Jackson & Moreland Division of United Engineers & Constructors, Inc.  
*Mechanical Engineering Technology (1960)*
- William R. Mann Jr.  
Instructor, Avionics.  
*Aviation Technology (1969)*
- Anton Mavretic, B.S., M.S., Ph.D.  
Staff Member, Massachusetts Institute of Technology.  
*Electrical Engineering Technology (1969)*
- Joseph H. Mazzola, B.S.  
Senior Engineer, Avco Systems Division.  
*Mechanical Engineering Technology (1969)*
- Richard F. McBrien, B.S.Ed., N.S.F.  
Teacher, Lynn Public Schools.  
*Physics (1967)*

- Francis T. McCabe, B.S., Ed.M.  
Headmaster, Rindge Technical School (Retired)  
*Engineering Graphics and Computation (1952)*
- Edward F. McCarren, Jr., A.E.  
Engineer, Baldwin-Lima-Hamilton, Corporation.  
*Electrical Engineering Technology (1951)*
- Charles R. McGeoch, Jr., B.S., M.S.  
Senior Development Engineer, Microwave Associates, Inc.  
*Physics (1968)*
- Eugene L. McLaughlin, A.B., M.A.  
Head of Mathematics Department, Hyde Park High School.  
*Mathematics (1956)*
- Carl J. Mellea, S.B., M.S., P.E. (Mass., R.I., Maine, Vt., N.H.)  
Project Engineer, Howard, Needles, Tammen & Bergendorff.  
*Civil Engineering Technology (1960)*
- Walter Messcher, B.M.E., M.S.  
Engineer, Department of Transportation.  
*Course Consultant for Engineering Graphics and Computation (1966)*
- Carl Miller, A.B., LL.B., Ed.M.  
Assistant Principal, Boston School Department.  
*Course Consultant for Mathematics (1945)*
- Richard W. Miller, B.S., M.S., P.E. (Mass.)  
Supervisor, Flow Engineering Dept., The Foxboro Company.  
*Mechanical Engineering Technology (1959)*
- Ernest E. Mills, B.S., M.S., P.E. (Mass.)  
Associate Professor of Mechanical Engineering, Northeastern University.  
*Program Consultant for Mechanical Engineering Technology (1947)*
- Edmund J. Mitchell, B.S.E.E., M.S.E.E.  
Member, Technical Staff, Sanders Associates.  
*Electrical Engineering Technology (1968)*
- Brij Mohan, B.S., M.S.  
Senior Engineer, Honeywell Electronic Data Processing.  
*Civil Engineering Technology (1969)*
- George Moy, B.S., M.S.  
Senior Stress Engineer, Babcock & Wilcox Company.  
*Mechanical Engineering Technology (1965)*
- Robert L. Moyer, B.A.  
Graduate Teaching Fellow, Biology, Northeastern University.  
*Biology (1970)*
- Richard C. Murphy, B.S., M.Ed.  
Physics Teacher, Boston English High School.  
*Physics (1965)*
- Roy A. Nelson, B.S.E.E.  
Consultant, Applied Measurements, Inc.  
*Electrical Engineering Technology (1969)*
- Robert L. Norton, A.S., B.S., M.S.  
Research Associate, Tufts N.E. Medical Center.  
*Graphics & Computation (1967)*
- John R. O'Brien, A.B., A.M.  
Head Master, Dorchester High School.  
*Mathematics (1946)*

- John C. O'Callahan, B.S., M.S., Ph.D.  
Technical Director, KPA Nuclear, Inc.  
*Mechanical Engineering Technology (1961)*
- Ray O. Oglesby, B.S.Ed., M.S.Ed.  
Teacher, Weeks Junior High School.  
*Mathematics (1967)*
- Yesugey Oktay, M.S., P.E. (Mass., New York, Maine, Indiana)  
The Badger Company, Inc., Civil Engineer.  
*Civil Engineering Technology (1970)*
- Carl A. Olson, Jr., B.S., Ed.M.  
Department Head, Wellesley High School.  
*Engineering Graphics and Computation (1964)*
- Arthur P. Ottaviano, B.A.  
Teaching Assistant, Northeastern University  
*Biology (1969)*
- Thomas J. Owens, A.B., M.Ed.  
Instructor in Mathematics, Quincy High School.  
*Mathematics (1952)*
- Charles A. Packard, B.S., M.E., Ed.M.  
Guidance Counselor, Roslindale High School.  
*Engineering Graphics and Computation (1965)*
- Philip Palermo, B.S.  
Teaching Assistant, Chemistry, Northeastern University.  
*Chemistry (1967)*
- James A. Palmer  
Electronic Technician, Northeastern University.  
*Electrical Engineering Technology (1961)*
- Burton S. Parker, B.S., P.E. (Mass.)  
Mechanical Engineer, Army Materials and Mechanics Research Center.  
*Mechanical Engineering Technology (1963)*
- William M. Parker, LL.B., A.E.  
General Manager, Tuners Supply Company, Inc.  
*Mathematics (1957)*
- William H. Parmenter, A.E., B.B.A.  
Instructor, Newton Technical High School.  
*Electrical Engineering Technology (1952)*
- Joseph V. Pearincott, B.Sc., M.Sc., Ph.D.  
Associate Professor of Biology, Northeastern University.  
*Biology (1967)*
- Sheng-Jui Peng, B.S.  
Teaching Assistant.  
*Mechanical Engineering Technology (1970)*
- Richard W. Peterson, B.S.  
Radiochemist, New England Nuclear Corporation.  
*Physics (1968)*
- Peter J. Philliou, B.S. Eng., M.S. Math, M.S. Mgt., M.S. Astronautics  
*Mathematics (1967)*
- Dominic A. Piccione, B.S., M.S.  
*Mechanical Engineering Technology (1966)*
- Norman C. Poirier, B.S., M.S.  
Research Associate, Northeastern University.  
*Electrical Engineering Technology (1966)*
- Donald J. Poulin, A.E., P.E. (Mass.)  
Associate Engineer, Western Electric Company.  
*Electrical Engineering Technology (1970)*

- Daniel W. Pratt, B.S., M.S.  
Instructor, Boston Technical High School.  
*Mathematics (1967)*
- Charles H. Price, Jr., B.S., M.S.  
Principal Engineer, Honeywell, EDP.  
*Electrical Engineering Technology (1960)*
- Sidney F. Quint, S.B., S.M., P.E. (Mass.)  
Systems Engineer, Raytheon Company.  
*Electrical Engineering Technology (1954)*
- Dr. Barbara Raisbeck, B.S., Ph.D.  
Research Associate, Tufts University.  
*Biology (1970)*
- Gerard H. Ratcliffe, A.B.  
Ratcliffe Marine Design.  
*Electrical Engineering Technology (1955)*
- Bernard C. Reddy, B.S., M.Ed.  
Teacher of Science, Blue Hills Technical High School.  
*Course Consultant for Physics (1965)*
- Edward L. Rich, B.S., M.S., P.E. (Mass.)  
Principal Engineer, Raytheon Company.  
*Mechanical Engineering Technology (1956)*
- William Richmond, B.S., Ed.M.  
Physics Instructor, Everett High School.  
*Mathematics (1964)*
- Lance E. Robson, B.S., M.S., P.E. (New York, N.H.)  
Engineer, Charles T. Main, Inc.  
*Civil Engineering Technology (1969)*
- George B. Rochfort, Jr., B.S., Ph.D.  
Acting Chairman and Associate Professor of Instruction, Northeastern University.  
*Program Consultant for Aviation Technology (1968)*
- Bertram Rockower, B.S., M.S., P.E. (Mass.)  
Assistant Director, M.I.T. Draper Laboratory.  
*Mechanical Engineering Technology (1967)*
- Fred A. Rosenberg, A.B., Ph.D.  
Associate Professor of Biology, Dept. of Biology, Northeastern University.  
*Program Consultant for Biology (1967)*
- Eric A. Roy, B.A., M.Ed.  
Instructor, Boston English High School.  
*Mathematics (1967)*
- Thomas E. Ruden, B.S., M.S.  
President, Microwave Power Technology Company.  
*Physics (1967)*
- Donald L. St. Andre, B.S., M.Ed.  
Head Mathematics Department, Framingham North High School.  
*Mathematics (1967)*
- Leo D. Salvucci, A.B., M.Ed., M.S.T.  
Master, Boston Latin School.  
*Mathematics (1965)*
- Costa Samar, B.S., M.S.T.  
Mathematics Specialist, Needham Public Schools.  
*Mathematics (1965)*

Donald S. Scheufele, B.S., M.S., Ph.D.  
Instructor, Melrose High School.  
*Chemistry (1962)*

Henry Schwartz, A.B., M.Ed., P.E. (Mass.)  
Field Engineer, CA-PRA Inc.  
*Physics (1958)*

Robert T. Schwartz, B.S., M.S., P.E. (Mass.)  
Consulting Engineer, R.T.S. Associates.  
*Electrical Engineering Technology (1966)*

Robert I. Serody, S.B.E.E., M.S.E.E.  
Task Manager, Raytheon Company.  
*Electrical Engineering Technology (1967)*

Paul J. Sevigny, M.S., B.S., M.B.A.  
Research Associate, Northeastern University.  
*Mechanical Engineering Technology (1969)*

Ralph W. Sexton, B.S., M.S., P.E. (Mass., N.H.)  
Associate Professor of Mechanical Engineering, Northeastern University.  
*Course Consultant for Mechanical Engineering Technology (1966)*

Harold M. Sharaf, B.S., M.S.  
Technical Advisor, Anderson Power Products, Inc.  
*Course Consultant for Electrical Engineering Technology (1955)*

Irwin Shear, A.B., M.S.  
Data Base Manager, Raytheon Company, Equipment Division.  
*Engineering Graphics and Computation (1967)*

Walter S. Shields, B.S., Ed.M., M.S.  
Instructor, Needham Public Schools.  
*Mathematics (1966)*

Shafiq S. Shukri, B.Sc., M.D.  
Assistant Professor, Northeastern University.  
*Biology (1968)*

Bernard Sidman, B.A., M.Ed., M.A.  
Research Engineer, Sylvania Electric Products, Inc.  
*Mathematics (1968)*

Charles Siegel, A.B., M.A.  
Instructor, Needham Senior High School.  
*Mathematics (1967)*

Bernard Silver, B.A., D.D.S.  
Director of Dental Clinics, Old Soldiers Home.  
*Biology (1969)*

John M. Slepetz, B.C.E., M.C.E., Ph.D., P.E. (Va.)  
*Mechanical Engineering Technology (1970)*

George B. Smith, B.S.E.E.  
Design Engineer, Raytheon Company.  
*Electrical Engineering Technology (1967)*

Roderic W. Sommers, B.S., M.Ed.  
Associate Professor of Cooperative Education, Northeastern University.  
*Academic Counsellor (1969)*

Elliot Spector, B.S., Ph.D.  
Professor of Pharmacology, Northeastern University.  
*Chemistry (1968)*

S. Leonard Spitz, B.S., M.S., P.E. (Mass.)

Engineering Consultant.

*Mechanical Engineering Technology (1955)*

Richard E. Sprague, B.B.A., B.S.C.E., M.B.A., Ed.M.

Assistant Director, Graduate School of Engineering, Northeastern University.

*Academic Counsellor (1967)*

Benjamin R. Stahl, A.B.

Manager, Training Integration, Equipment Division, Raytheon Company.

*Engineering Graphics and Computation (1966)*

Joseph E. Steffano, B.S., M.S., P.E. (Mass., Vt., N.H., Conn., Me., R.I., N.Y.); R.L.S. (Mass., Conn., N.H., Me., R.I., Vt.)

Structural Engineer, Stone & Webster Engineering Corporation.

*Civil Engineering Technology (1965)*

Matthew Stevens, B.S.

Director, Radiologic Technology, Northeastern University.

*Program Consultant for Radiologic Technology. (1968)*

Robert B. Stitt, B.B.A., M.B.A.

*Electrical Engineering Technology (1960)*

M. Carlton Storms, B.A., M.Ed.

Teacher, Braintree High School.

*Physics (1967)*

Raimundas Sukys, B.S., M.S.

Research Associate in Electrical Engineering, Northeastern University.

*Electrical Engineering Technology (1962)*

David M. Sumner, B.S.

Instructor, King Philip Regional High School.

*Engineering Graphics and Computation (1966)*

Laurence R. Swain, Jr., B.S., M.S.

Manager, Advanced Products, Computer Displays, Inc.

*Physics (1968)*

Dexter E. Swift, B.S., M.Ed.

Teacher, City of Lynn.

*Physics (1968)*

Ralph V. Tangney, B.B.A.

Quality Control Engineer, Honeywell.

*Physics (1968)*

Albert Tashian, Jr., B.S.C.E.

Engineer, Teledyne Materials Research.

*Mechanical Engineering Technology (1969)*

Jason R. Taylor, B.S., M.S.

Executive Director, Wang Laboratories.

*Mathematics (1966)*

Maurice Temple, B.S., M.Ed., M.S.

Associate Professor of Physical Science, Boston State College.

*Mathematics (1956)*

Esther E. Thomas, B.S., M.A.

Boston Medical Laboratory, Supervisor of Hematology.

*Biology (1969)*

Umanath Tiwari, B.S., M.S. (India), M.S. (N.U.)

Mathematics Department, Northeastern University.

*(1969)*

Phineas Tobe, A.B., Ed.M.

Head of Science Department, Girls' Latin School.

*Physics (1960)*

Richard W. Torian, B.S.Ed., M.Ed.

Mathematics Department Chairman, Ashland Senior High School.

*Mathematics (1967)*

Melvin W. Tracey, B.S., S.M.

Staff Aeronautical Engineer, Itek Corporation.

*Mechanical Engineering Technology (1968)*

John S. Travia, B.S.E.E., M.S.E.E., M.S.E.M., P.E. (Mass.)

Senior Engineer, Raytheon Company.

*Electrical Engineering Technology (1965)*

Vanhuy Truong, M.Sc.

*Mechanical Engineering Technology (1970)*

John F. Videler, B.S., M.S.

Chief, Instrument Control, Avco Corporation.

*Physics (1968)*

Arthur M. Vuilleumier

Head of Electronics Department, Blue Hills Regional Vocation Technical High School.

*Electrical Engineering Technology (1953)*

Richard Wadler, A.E., P.E. (Mass.)

Senior Mechanical Engineer, Raytheon Company, Missile and Space Division.

*Mechanical Engineering Technology (1953)*

Thomas H. Wallace, S.B., M.A., Ph.D.

Professor of Physics, Northeastern University.

*Program Consultant for Physics (1941)*

Robert M. Walters, B.S., M.S. (ME), NAV.E.

Lieutenant Commander, U.S.N., Naval Engineer.

*Physics (1968)*

Morton D. Weinert, A.B., Ed.M., M.Ed.

Head of the Mathematics Department, Boston Latin School.

*Mathematics (1955)*

Ralph A. Wellings, B.S., Ed.M.

Mathematics Instructor, Boston Latin School.

*Mathematics (1955)*

Ralph E. Wellings, A.B., A.M., Ed.M.

Head of Science Department, Brighton High School (Retired)

*Physics (1944)*

Charles S. Whalen, B.S.M.E., M.S.M.E., P.E. (Mass.)

Research & Development Engineer, Inertial Guidance, Raytheon Company.

*Mechanical Engineering Technology (1968)*

Thomas F. White, B.S., B.S.M.E.E., M.Ed., M.A.

Coordinator of Mathematics K-14, Quincy Public Schools.

*Mathematics (1957)*

Willard B. Whittemore, B.S., in C.E., Ed.M., C.A.G.S.

Head Mathematics Department, Everett High School.

*Course Consultant for Mathematics (1957)*

Rudolph P. Widman, A.B., M.S.

Ph.D. Candidate, Northeastern University.

*Chemistry (1963)*



Joseph F. Willard, B.S., P.E. (Mass.), R.L.S. (Mass.)

Supervising Civil Computer Engineer, Data Processing Section,  
Massachusetts Department of Public Works.

*Civil Engineering Technology (1949)*

Donald K. Willim, B.S., M.S., P.E. (Mass.)

Staff, Massachusetts Institute of Technology, Lincoln Laboratory.

*Physics (1961)*

Albert G. Wilson, Jr., B.S., M.S., P.E. (Mass.), S.E. (Ill.)

Member Gilbert Small & Company, Consulting Engineers.

*Course Consultant for Mechanical Engineering Technology (1948)*

Kenneth S. Woodard, B.S.

Associate Professor, Graphic Science, Northeastern University.

*Academic Counsellor (1967)*

Gerald L. Woodland, Jr., B.S., M.S., P.E. (Mass., N.Y.)

Assistant Manager, Systems Analysis & Programming Division,  
Stone & Webster Engineering Corporation.

*Engineering Graphics and Computation (1966)*

Robert D. Wright, A.E.E., M.S.C.S.

Leader, Advanced Disc Storage Development; R.C.A.

*Electrical Engineering Technology (1955)*

Walter Zagieboylo, M.S., M.E., P.E. (Mass.)

Research Engineer, U.S. Army Natick Labs.

*Mathematics (1969)*

Walter P. Zanor, B.S.B.A.

Instructor, Everett High School.

*Mathematics (1967)*

Northeastern University

Lincoln College

360 Huntington Avenue

Boston, Massachusetts 02115

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Street Address

\_\_\_\_\_  
City

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State

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Zip Code

# NORTHEASTERN UNIVERSITY

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Graduate School of Pharmaceutical Sciences

Graduate School of Professional Accounting

\*\*\*School of Law

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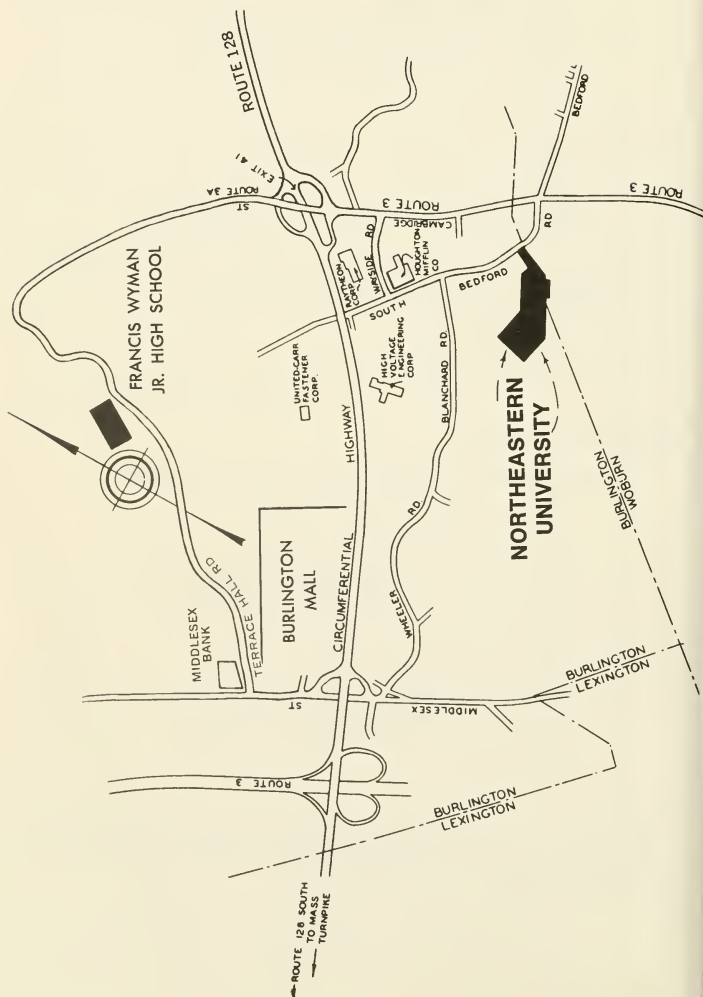
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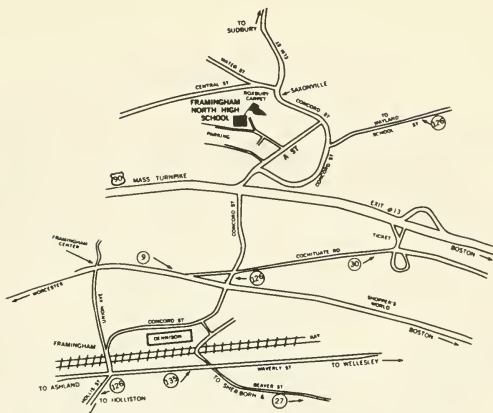
\*\*\*Juris Doctor (J.D.)

## suburban maps

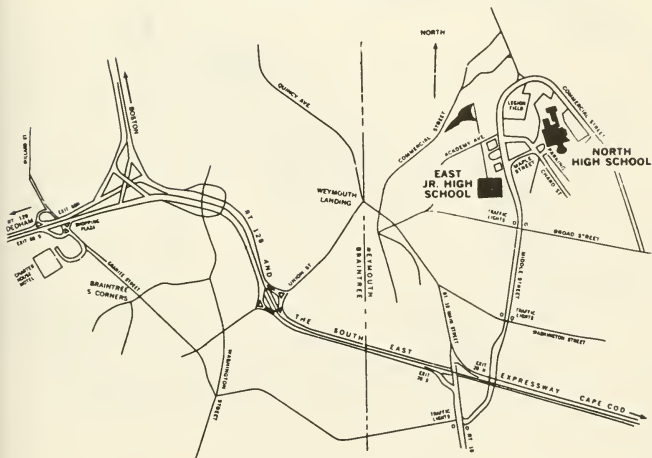
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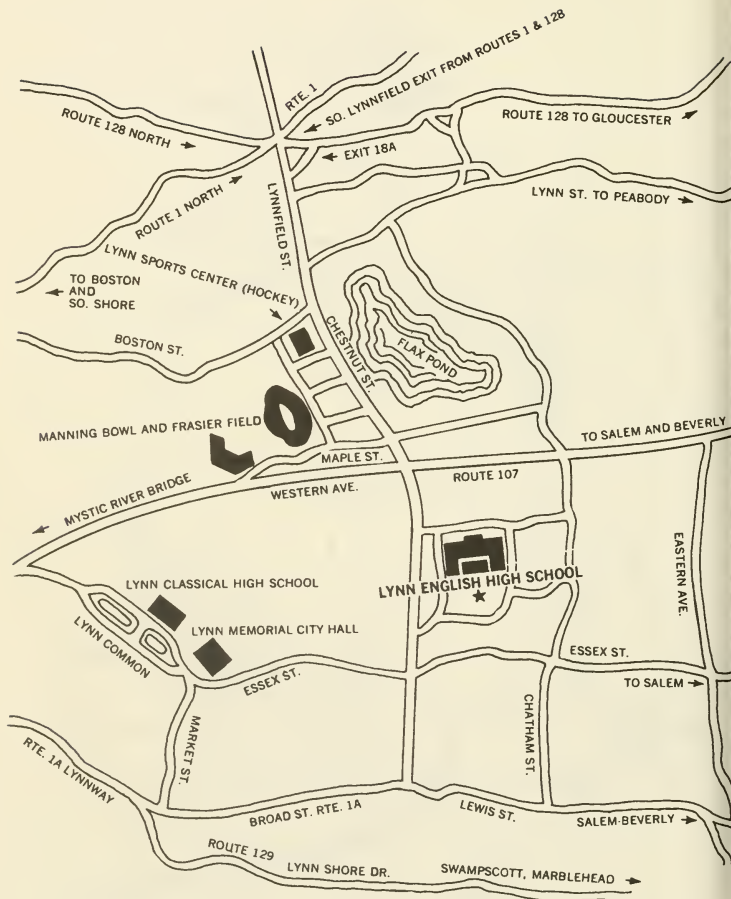
## Framingham North High School



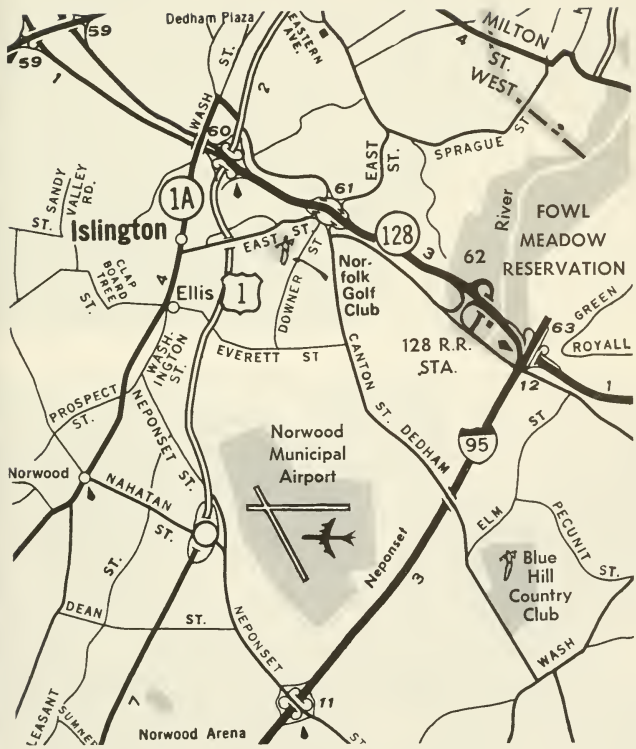
## Weymouth Schools

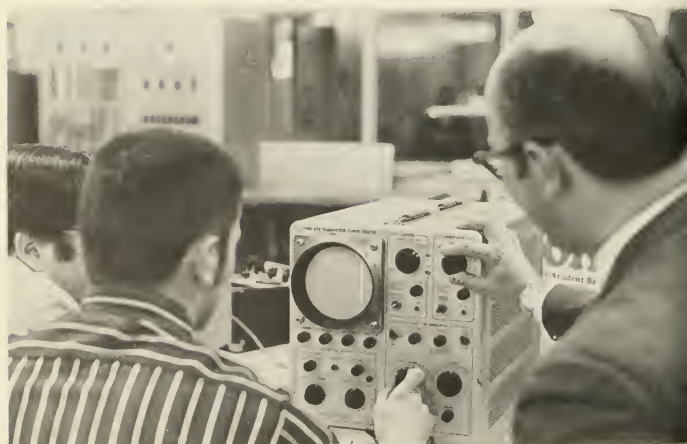


# Lynn English High School



Norwood Airport







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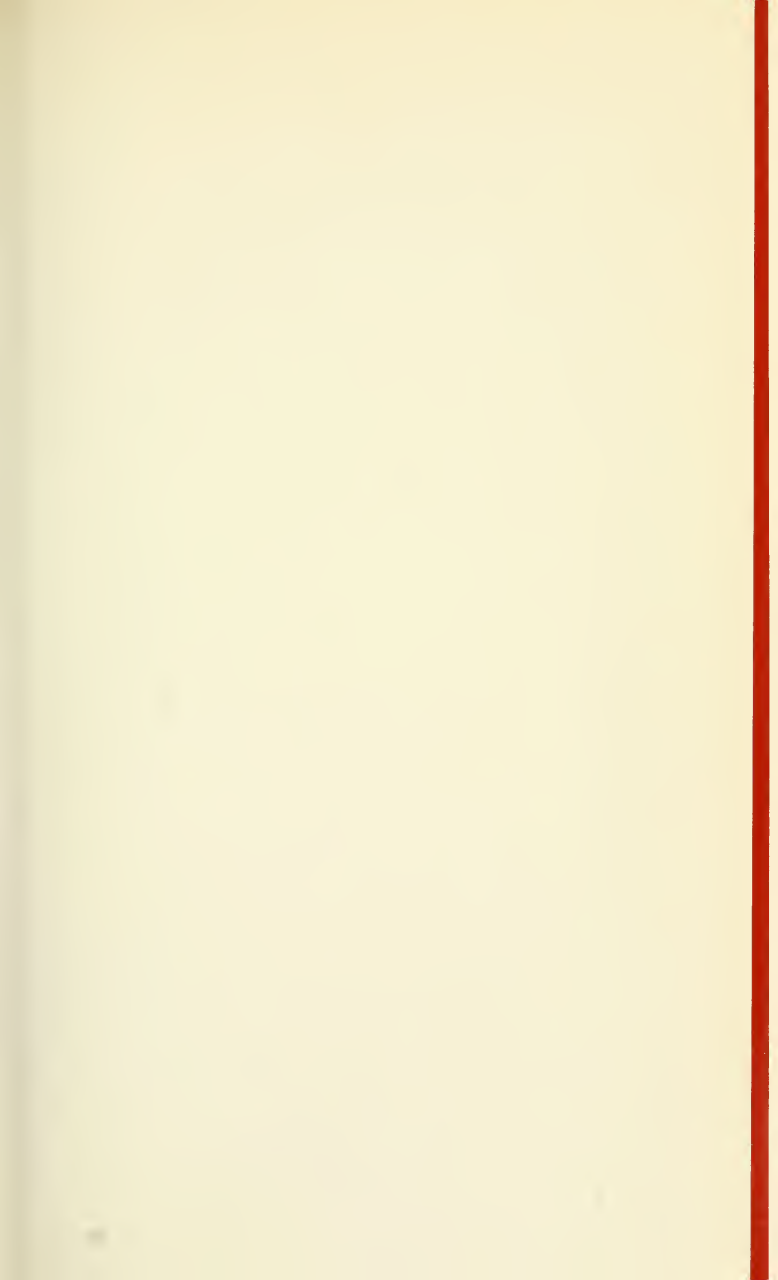
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the same time, the *Journal* was not a journal of the day, but a journal of the future.

It was not until the 1930s that the *Journal* began to take on a more traditional form, with a focus on the present and the past. This was a result of the influence of the New Criticism, which emphasized the importance of the text itself, rather than the author's intentions or the reader's response.

By the 1940s, the *Journal* had become a leading journal of literary criticism, and it continued to grow in influence throughout the 1950s and 1960s. Today, it remains one of the most important journals in the field of literary studies.

The *Journal* has a long and distinguished history, and it continues to be a leading journal of literary criticism. It is a journal that has shaped the field of literary studies, and it will continue to do so for many years to come.

The *Journal* is a journal of the future, and it is a journal that has shaped the field of literary studies. It is a journal that has a long and distinguished history, and it will continue to be a leading journal of literary criticism for many years to come.

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northeastern university



university college 1971-1972





# northeastern university university college 1971-1972

Part-Time Undergraduate Programs  
business administration  
health-related programs  
law enforcement  
liberal arts  
education



Northeastern University  
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Boston, Massachusetts 02115  
(617) 437-2400



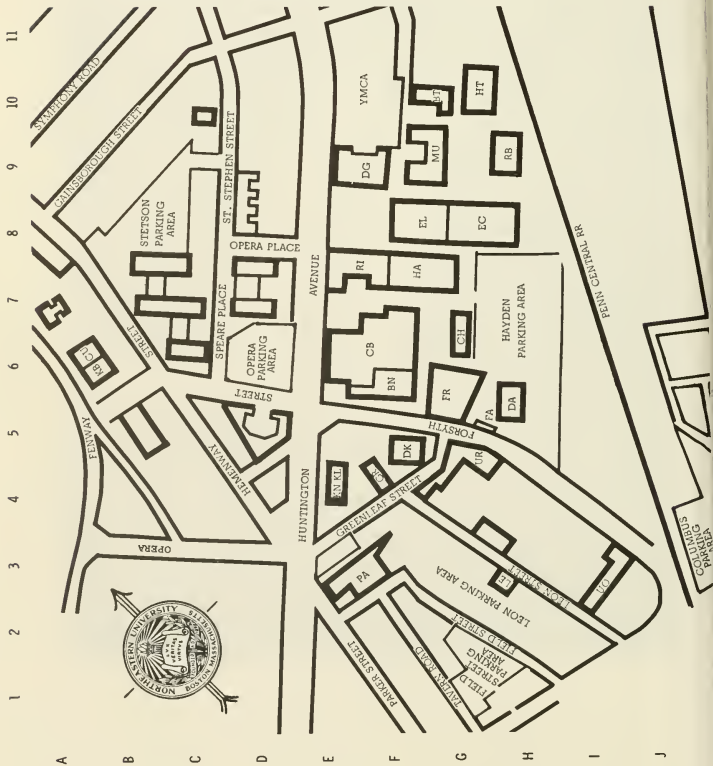
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MAP  
REFERENCE

Building	Building Designation
Bartlett Natatorium	BN
Botolph Building	BT
Cabot Physical Education Ctr.	CB
Churchill Hall	CH
Cushing Hall	CU
Dana Research Center	DA
Dockser Hall	DK
Dodge Library	DG
Eli Student Center and Alumni Auditorium	EC
Forsyth Building	EL
Forsyth Building Annex	FR
Forsyth Dental Building	FA
Greenleaf Building	GR
Hayden Hall	HA
Hurtig Hall (Chemistry)	HT
Kennedy Building	KB
Knowles Center (Crim. Justice)	KN
Knowles Center (Law)	KL
11 Leon Street	KU
40 Leon Street	LE
Mugar Life Sciences Building	MU
Parker Building	PA
Richards Hall	RI
Robinson Hall	RB
United Realty Building	UR

F6  
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F4  
F7  
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E4  
J3  
E4  
H3  
F9  
F3  
E7  
H9  
G5

## UNIVERSITY COLLEGE OFFICES

Office for General Information	102 Churchill Hall	437-2400
Office of the Registrar	120 Hayden Hall	437-2300

### Regular Office Hours

Boston	Monday–Friday	8:30 a.m.–8:30 p.m.
	Saturday	8:30 a.m.–12 noon
Burlington	Monday–Friday	8:00 a.m.–10:00 p.m.
	Saturday	8:00 a.m.–1:00 p.m.
Framingham North High School	Monday–Thursday	5:30–10:00 p.m.
Lynn English High School	Monday–Thursday	5:30–10:00 p.m.
Weymouth High Schools	Monday–Thursday	5:30–10:00 p.m.

### Summer Office Hours

Boston 102 Churchill Hall	Monday–Thursday	8:30 a.m.–8:30 p.m.
	Friday	8:30 a.m.–4:30 p.m.
	Saturday	Closed
120 Hayden Hall	Monday–Friday	8:30 a.m.–8:30 p.m.
	Saturday	8:30 a.m.–12 noon
Burlington	Monday–Friday	8:00 a.m.–10:00 p.m.
	Saturday	8:00 a.m.–1:00 p.m.

### Program Advisers

Program advisers are available each evening by appointment in the University College Office. These faculty members are competent to assist the student in planning a program suitable to his general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office (437-2400) or by coming in person to 102 Churchill Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

### Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns are available days and certain weekday evenings until 8:30 p.m. Information regarding fees and appointments may be obtained by calling 437-2142, or by going to the Counseling and Testing Center, 302 E11 Student Center.

## 1971-1972 ACADEMIC CALENDAR

### Fall Quarter 1971

Classes begin September 27

#### FALL REGISTRATION

Boston—All Students	5:30—8:30 p.m.	September 7
	12 noon—8:30 p.m.	September 9
	5:30—8:30 p.m.	September 13 and 14
	5:30—8:30 p.m.	September 15, 16 and 17
	9 a.m.—12 noon	September 18
	5:30—8:30 p.m.	September 20-24
Burlington—All Students	12 noon—8:30 p.m.	September 8
	5:30—8:30 p.m.	September 14 and 20
Lynn English High— All Students	5:30—8:30 p.m.	September 14 and 20
Weymouth East Jr. High School—All Students	5:30—8:30 p.m.	September 14 and 20
Framingham North High School—All Students	5:30—8:30 p.m.	September 14 and 20
Classes begin		September 27
Columbus Day Observed	No Classes	October 11
Veterans' Day Observed	No Classes	October 25
Thanksgiving Recess	No Classes	November 25-27
Final Examination Period For Fall Quarter		December 14-20

### Winter Quarter 1971-1972

Classes begin January 3, 1972

#### WINTER REGISTRATION

Boston—All Students	5:30—8:30 p.m.	December 13-17
Burlington—All Students	5:30—8:30 p.m.	December 14
Lynn English High— All Students	5:30—8:30 p.m.	December 13
Weymouth—All Students	5:30—8:30 p.m.	December 16
Framingham—All Students	5:30—8:30 p.m.	December 15
Christmas Vacation		December 21-January 2
Classes Begin		January 3
Washington's Birthday Observed	No Classes	February 21
Final Examination Period For Winter Quarter		March 20-25

### Spring Quarter 1972

Classes begin April 3

#### SPRING REGISTRATION

Boston—All Students	5:30—8:30 p.m.	March 20-24
Burlington—All Students	5:30—8:30 p.m.	March 21
Lynn English High— All Students	5:30—8:30 p.m.	March 20

Weymouth—All Students	5:30—8:30 p.m.	March 23
Framingham—All Students	5:30—8:30 p.m.	March 22
Spring Recess (or make-up period for lost snow days)		March 27—April 1
Spring Quarter begins		April 3
Patriot's Day Observed	No Classes	April 17
Memorial Day Observed	No Classes	May 29
Recess No Classes		June 13—17
Final Examination Period		
For Spring Quarter		June 19—24
Commencement		June 18

## Summer Quarter 1972

Classes begin June 26

## REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston—All Students	5:30–8:30 p.m.	June 19–23
Burlington—All Students	12 noon–8:30 p.m.	June 20
Independence Day Observed	No Classes	July 4
Labor Day Observed	No Classes	September 4
Final Examination Period For Summer Quarter		September 11–15

## 1971

## 1972

S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
AUGUST							NOVEMBER							JANUARY	1	MAY				
1	2	3	4	5	6	7	1	2	3	4	5	6		2	3	4	5	6	7	8
8	9	10	11	12	13	14	7	8	9	10	11	12	13	9	10	11	12	13	14	15
15	16	17	18	19	20	21	14	15	16	17	18	19	20	16	17	18	19	20	21	22
22	23	24	25	26	27	28	21	22	23	24	25	26	27	23	24	25	26	27	28	29
29	30	31					28	29	30					30	31					
SEPTMBER							DECEMBER							FEBRUARY		JUNE				
1	2	3	4				1	2	3	4				1	2	3				
5	6	7	8	9	10	11	5	6	7	8	9	10	11	6	7	8	9	10	11	12
12	13	14	15	16	17	18	12	13	14	15	16	17	18	13	14	15	16	17	18	19
19	20	21	22	23	24	25	19	20	21	22	23	24	25	20	21	22	23	24	25	26
26	27	28	29	30			26	27	28	29	30	31		27	28	29	30			
OCTOBER														MARCH		JULY				
1	2													1	2	3	4	5	6	7
3	4	5	6	7	8	9								5	6	7	8	9	10	11
10	11	12	13	14	15	16								12	13	14	15	16	17	18
17	18	19	20	21	22	23								19	20	21	22	23	24	25
24	25	26	27	28	29	30								26	27	28	29	30		
31														26	27	28	29	30	31	
														APRIL						
														1	2	3	4	5	6	7
														2	3	4	5	6	7	8
														9	10	11	12	13	14	15
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														23	24	25	26	27	28	29
														30						
														31						

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Jacqueline Platt, B.S., *Administrative Assistant*  
John W. Schermerhorn, Ph.D., *Dean, Division of Health Sciences*  
Kenneth C. Solano, A.B., *Asst. Director of Admissions and Dir. Student Activities*  
Ralph T. Vernile, Jr., B.S., *Director of Administrative Services*

Committee on Academic Standing

William T. Edgett, *Chairman*

Kenneth W. Ballou	Timothy F. Moran
Sidney Herman	Harold Naidus
Rosemary Hurkamp	John W. Schermerhorn
Paul D. Maxwell	

Committee on Regulations & Discipline

Kenneth W. Ballou, *Chairman*

William T. Edgett	Paul D. Maxwell
Sidney Herman	Timothy F. Moran
Rosemary Hurkamp	Harold Naidus
William F. King	Kenneth C. Solano
J. Antony Lloyd	President, Adult Student Council

Library Committee

Rosemary Hurkamp, *Chairman*

Kenneth W. Ballou (ex-officio)	Marvin Lesser
Harold Naidus	William Kidney
Timothy F. Moran	Two Students

Business Administration Curriculum Committee

Paul D. Maxwell, *Chairman*

Kenneth W. Ballou (ex-officio)	Paul C. Richards
Sidney Herman	Joel M. Rosenfeld
James W. Earley	Three Students
Thomas J. McNamara	

### **Law Enforcement Curriculum Committee**

Timothy F. Moran, *Chairman*

Lois Ames	Sidney Herman
Kenneth W. Ballou (ex-officio)	Norman Rosenblatt
Joseph Connors	Three Students
Three Part-time Faculty Members	

### **Liberal Arts Curriculum Committee**

Harold Naidus, *Chairman*

Kenneth W. Ballou (ex-officio)	A. Bertrand Warren
Marvin X. Lesser	Robert L. Wells
Roland L. Nadeau	R. Gregg Wilfong
Raymond H. Robinson	Three Students
Morton Rubin	Three Part-time Faculty Members
Sidney Herman	
Harold Goldstein	





# the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which comprises more than 150 distinguished business and professional men.

From its beginning Northeastern University's dominant purpose has been to identify community educational needs and to meet these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, under which students alternate periods of work and study. The Plan was initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouv   College (1964), and the College of Criminal Justice (1967).

This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also enables them to contribute substantially to the financing of their education. The "Co-op" Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting, business administration, and law.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

## UNDERGRADUATE COLLEGES

### **Boston-Bouvé College**

Boston-Bouvé College offers three major programs of study: physical education and recreation education, both leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### **College of Business Administration**

The College of Business Administration offers programs of study in the principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

The Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

### **College of Criminal Justice**

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science in Criminal Justice.

### **College of Education**

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed to prepare students for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides employment in libraries, social service agencies, and school systems.

### **College of Engineering**

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil and Electrical Engineering. These programs extend over eight years, cover the identical courses given in the day cooperative curricula, and meet the same qualitative and quantitative standards of scholarship.

### **College of Liberal Arts**

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts degree. With the exception of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

### **Lincoln College**

Lincoln College offers associate and bachelor degree programs in the evening on a part-time basis. Programs of study include Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Lincoln College and University College offer joint programs leading to the Bachelor of Science degree in Industrial Technology, Medical Technology, Chemical-Biological Technology, and Cyto-technology.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

### **College of Nursing**

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations, and leading to the Associate in Science degree.
- (b) A five-year curriculum in preparation for the R.N. Examinations, and leading to the Bachelor of Science degree in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable cooperative work opportunities during the students' upper-class years in these programs.

### **College of Pharmacy**

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, with the senior year devoted to full-time study at the University.

### **University College**

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in liberal arts, business administration, law enforcement, education, and health-related programs, leading to the Associate in Science and Bachelor of Science degrees. It does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of forty quarter hours of credit. Courses are offered in Boston as well as at Burlington, Framingham, Lynn, Weymouth, and several other convenient locations.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

In collaboration with Lincoln College, University College offers programs in Allied-Medical Technology and Science Technology leading to the Bachelor of Science degree. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## **GRADUATE SCHOOLS**

### **Actuarial Science**

Master of Science in Actuarial Science.

### **Arts and Sciences**

Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### **Boston-Bouvé College**

Master of Science in Physical Education and Master of Science in Recreation Education.

### **Business Administration**

Master of Business Administration.

### **Education**

Master of Education, and the Certificate of Advanced Graduate Study.

### **Engineering**

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; Engineer degree; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

### **Law**

Juris Doctor.

### **Pharmaceutical Sciences**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology; Doctor of Philosophy in Medicinal Chemistry.

### **Professional Accounting**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

## **INSURANCE INSTITUTE**

The Insurance Institute, which is sponsored by local insurance organizations and companies, has recently joined University College. It offers a number of non-credit courses in preparation for the Chartered Life Underwriter and Chartered Property-Casualty Underwriter Designations as well as for the General Insurance, Insurance Adjuster, and Risk Management Certificates. (437-2506).

## **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers several programs dealing with current needs and problems. Through its Division of Community Services, working

with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## **AFFILIATED PROGRAMS**

### **For Dental Hygienists**

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

### **For Medical Technologists and Cytotechnologists**

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Science.

Bachelor of Science degree programs in Medical Technology and Cytotechnology are offered jointly on a part-time basis by Lincoln College and University College in cooperation with several approved hospital schools.

### **For Nurses**

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from several hospital schools of nursing in the area.

## **RESEARCH ACTIVITIES**

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



# buildings and facilities

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

## **Carl S. Eli Student Center**

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

## **The University Library**

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 240,000, and microfilm titles, 250,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, maps, company publications, the pamphlet file, and association publications. Theses, under



the supervision of the Reference Dept., housed in the basement, and available on request in the Reference Room.

3. The Periodical Collection on the basement level, housed in the Periodical Room, consisting of current periodicals, periodical indexes, and abstracts, with two adjacent stack levels for back files of bound volumes.
4. The Reserve Book Collection on the second floor.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk. Trade bibliographies also located here.
6. The Collections of Fine Arts, Philosophy, Psychology, Religion, and Education housed in the Richardson Room on the second floor. The Audio Facility for spoken and music recordings and magnetic tapes for instructional and individual use also located in this room.
7. The American and English Literature Collections in the Literature Reading Room.
8. Government Documents maintained on the basement level adjacent to the Periodical Room, along with the Microtext Collection. This collection includes 250,000 titles in microprint, microfilm, and microfiche forms.

The Card Catalog is a union list of materials in the University libraries and is located in the Webster Reading Room. There are also book catalogs of the collections in the Math/Psych Library, Chemistry Building Library, Documents and Reserve Rooms. There is an Information Desk in this room to assist people in using the card catalog during the day.

The Circulation Dept. has a printed list of all materials charged out, which may be consulted by all users. To borrow materials, university identification must be presented. For extensive research, where the University Library does not have the material, application should be made to the Inter-Library Loan Librarian for materials needed from other libraries. Information service is available in this Dept. in the evenings.

#### **Library Hours — Boston Campus**

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday	8:30 a.m. to 4:00 p.m.
Sunday & Holidays	1:00 p.m. to 10:00 p.m.

The Reference Room and the reading rooms on the second floor are open until midnight, Monday-Thursday and until 10:00 p.m. on Friday.

The University Library System includes three graduate libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center. Mathematics-Psychology is housed on the fifth floor of the United Realty Building and Chemistry is located on the first floor of Hurtig Hall.

#### **Library Hours — Suburban Campus, Burlington**

Monday — Friday	8:30 a.m. to 9:00 p.m.
Saturday	8:30 a.m. to 1:00 p.m.

### **Suburban Campus**

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

### **Henderson House**

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

### **Warren Center**

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports, including aquatics. Buildings include a lodge, cottages, and an infirmary.

### **Marine Science Institute**

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated the year around.

# university college

## **The Programs**

University College is committed to the education of mature, adult students who wish to live effectively in today's complex society. The programs in University College are specifically designed to satisfy the changing professional, cultural, and social needs and interests of adults.

Degree programs have been developed in 30 major fields of study in the areas of business administration, education, liberal arts, law enforcement, and health-related programs. Flexible curricula are offered on a part-time basis Monday through Saturday during day and evening hours convenient to adult students. Students may elect single courses or may enroll in full degree programs leading to the Associate in Science or the Bachelor of Science degree. Short-term seminars are also offered for credit. Classes are scheduled in locations which are accessible to the urban and the suburban community. Students may attend classes at the Huntington Avenue Campus, Boston, or the Suburban Campus, Burlington, Massachusetts, as well as other off-campus locations north and west of Boston.

University College programs are constantly evaluated and redesigned when necessary in order to keep pace with the changing needs and interests of its students and the community.

## **The Faculty**

Approximately 700 men and women comprise the part-time teaching staff of University College. Included are members of the full-time faculty of the Basic Colleges of Northeastern University and other educational institutions in New England, as well as outstanding New England business and professional leaders with backgrounds of training and experience in specialized areas. The faculty are selected because they are highly successful in their fields and are well qualified to provide sound methods of teaching for adults in an interesting, inspiring, and effective manner.

## **The Student Body**

The student body of University College represents diversified interests which properly recognized and utilized become one of the basic strengths in adult education. There are approximately 12,000 students in University College who range in age from 18 years to beyond retirement. While some

students enroll in University College immediately after high school graduation, others may have graduated 25 years prior to enrollment in college-level courses.

University College students are men and women who have full-time commitments to their jobs, families, or other responsibilities. They may enroll in a single course or in a full degree curriculum, depending on whether their goal is job advancement, a new career, or personal enrichment.



# academic policies

## Admission

All applicants who satisfy the requirements as regular or special students are admitted as part-time students in University College. It is advisable for students to have an interview with an admissions counselor to help plan their academic program in University College, particularly in cases where previous credit has been completed at other institutions, in order to avoid possible duplication of courses. Because of the diversity of the student body in terms of background, age, interests, needs, etc., there are no entrance examinations and college board examination scores are not required. In lieu of entrance examinations, students must maintain a C average in order to be admitted to degree candidacy.

## Regular Students

To be enrolled as a regular student, that is, to become a degree candidate, the applicant must have completed an approved secondary school course, or the equivalent 15 units\* of a high school diploma. Equivalency certificates are accepted. Regular students are those students who expect to follow a degree program.

## Special Students

Special students are those students who do not wish to enroll in a full degree program, but are interested in taking only one or more courses appropriate to their needs or interests. Credits for these courses may be transferred to a degree program if the student decides to pursue a degree at a later time.

## Procedure for Admission as a Degree Candidate

1. Upon completion of 40 earned quarter hours of credit, the student should officially petition for admission to the status of a degree candidate. Forms for this purpose are available in the University College Office, 102 Churchill Hall.

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\*A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work, or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

2. If a student has completed 40 quarter hours of credit in University College, he cannot register for additional courses unless he has been officially accepted as a degree candidate.
3. In order to matriculate as a degree candidate, the student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average grade of C) for all courses completed before filing the petition.
4. The Committee on Academic Standing may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to give evidence of probable academic success. In this case the student will be notified in writing that arrangements for testing should be made by him with the University Counseling and Testing Center. A fee is charged for administering these tests.

### **Advanced Standing Credit**

After completion of matriculation requirements in University College (40 quarter hours in residence) Advanced Standing Credit may be obtained in two ways:

#### *By Transfer of Credit from Another Institution*

Subject to approval by the Director of Admissions, credit may be granted for work completed in other approved schools, colleges, or universities. An applicant who wishes to receive credit by transfer should indicate his desire when he applies for admission. He should write to the Registrar of the institution previously attended and request that an official transcript be sent to the Director of Admissions in University College. The transcript indicates honorable dismissal, courses completed, credits and grades received. The transcript should be sent well in advance of the registration period. The applicant should inform the Director of Admissions of his major field of interest so that the transcript will be evaluated appropriately.

Students who have been dismissed from another institution for academic reasons must accompany their application with a statement from the dean or other appropriate official of their previous institution setting forth the reasons for dismissal or probationary status with recommendation for continued study. All applicants will be considered on their own merits.

#### *By Examination*

1. For Credit: Advanced standing credit is awarded for work previously completed in courses comparable to those offered in University College or compatible with the objective of the student's curriculum. Credit is also granted for successful completion of appropriate examinations in the College Level Examination Program. (CLEP) Credit may be disallowed for work previously completed because of the remoteness of the time of study; however, these applicants will be granted the privilege of taking an examination for credit.
2. For Placement: Applicants who, as a result of previous training and experience, may be considered to possess sufficient knowledge of a subject

will be allowed the privilege of taking a special examination in particular courses.

The grade of B or better must be obtained in any examination taken for placement.

In all cases students admitted by transfer or advanced standing credit from any other institution must meet the requirements for matriculated status as set forth under the regulations applicable to regular students.

### **Residence Requirement**

Every candidate for the baccalaureate or associate degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 46 consecutive quarter hours of work in course, with the further provision that at least 12 of the 46 quarter hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who for causes beyond their control move outside of the reasonable commuting area of the College, and who have completed 134 or more quarter hours of credit in course, the Committee on Education will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 46 quarter hours of credit in courses in University College.

### **Quality Requirement for Graduation**

A cumulative quality point average of 2.00 (an average grade of C) is required for graduation. Advanced standing credits are not averaged in the cumulative score.

### **Graduation with Honor**

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at University College. Courses credited by advanced standing will be eliminated in determining honor graduates.

### **Attendance at Commencement**

All candidates for University College degrees are required to attend Commencement in the year of qualification. Degrees in absentia are awarded



only to candidates excused for personal or immediate-family illness, military service, or employment obligations which are beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean. Each petition will be acted upon by the Dean.

### **Quality Points**

The requirement for graduation from University College is 174 quarter hours with attainment of a quality point average of 2.00. Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses are included in quality point computations for graduation.

The method of figuring quality points is as follows: Each quarter hour credit of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade by 0. The total number of quality points, divided by the total number of quarter hour credits completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations, and attendance.

### **Quality Point Averages**

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Director of Admissions of University College.

### **Dean's List**

All matriculated students who have taken a minimum of (18) quarter hours in three consecutive quarters of an academic year and have completed all their courses with an average of 3.0 or better shall be placed on the Dean's List. Each student shall receive a letter of commendation from the Dean of University College.

### **Pass-Fail Courses**

Any student who is not on academic probation and who has completed (40) Q.H. of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each 10 Q.H. of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.



The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QPA.

Satisfactory completion of the work in all courses taken on the pass/fail system of grading will be designated on the transcript by the letter "S." Unsatisfactory work will be designated on the transcript by the letter "U." Any unsatisfactory grade must be handled according to the existing policy of the University, but must never be cleared through the election of the same course on the basis of the pass/fail system of grading.

An incomplete in a course taken on a pass/fail basis will be designated by the letter "X" on the transcript and must be treated according to the normal procedure for incomplete grades.

*The following REGISTRATION PROCEDURES shall prevail:*

Students wishing to use the pass/fail system of grading for a course must meet all prerequisites for such course and should signify their desire to apply for a specific course on the basis of this system at registration.

The student's decision to take a course on a pass/fail basis must be made prior to the second meeting of the course and no changes will be permitted thereafter.

### **Class Changes**

University College reserves the right to cancel, split, or combine classes when necessary.

### **Registration**

Before attending classes, students must report to the registration area to register. All students must complete their registration properly before attending class. Attendance at class, even with the instructor's permission, does not constitute registration.

No academic credit will be recorded for students not properly registered.

In order to insure academic success, students are strongly advised to adhere to course prerequisites.

### **Class Attendance and Preparation**

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. Consecutive absences may cause the removal of the subject or subjects from the student's schedule.

Two hours of preparation are normally required for each hour spent in the classroom.

### **Withdrawals**

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal. To withdraw from a course, the Registrar's

Office must be notified by the student and the appropriate withdrawal form filled out.

### **Change of Address**

Change of address and/or name should be reported immediately to the Registrar's Office.

### **Absence Because of Illness**

All students who are absent from school because of extended illness should inform the Registrar's Office by letter, message, or phone call.

### **Examinations**

Term tests are scheduled in each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination will be held at the end of each quarter in each course unless an announcement to the contrary is made.

### **Homework Assignments**

Students are responsible for obtaining their homework assignments by contacting their instructor or another student in their class. Homework assignments are not available in the University College Office.

### **Missed Final Examinations**

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a fee of \$5.00 for taking the special final examination. Petitions may be obtained from the Registrar's Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the schedule listed below:

<b>final examination missed during:</b>	<b>file petition no later than:</b>	<b>make-up final examination during week of:</b>
Fall Quarter	January 22, 1972	February 14, 1972
Winter Quarter	April 15, 1972	May 8, 1972
Spring Quarter	July 15, 1972	August 7, 1972
Summer Quarter	October 7, 1972	October 30, 1972

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus.

Students who do not take make-up final examinations as scheduled forfeit the make-up privilege. (See page 36 for I grade explanation.)

### **Grading System**

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0) — Outstanding  
 B (3.0) — Good  
 C (2.0) — Satisfactory

D (1.0) — Poor  
 F (0.0) — Failure  
 I (—) — Incomplete

A general average of "D" is unacceptable and will not allow a student to continue in University College or to receive a degree from Northeastern University. The "F" grade is a definite failure and requires repetition of course in its entirety. The "I" grade is given only when the student fails to take the final examination. (See page 36 for Explanation.)

### Grade Reports

An official grade report will be mailed approximately three weeks after the quarter is completed to each registered student. Grades will not be given over the telephone or at the Registrar's Office.

### Calculation of Quality Point Average

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality point average.
2. A grade of "I" will not be considered in the calculation of the quality point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality point average computations.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours		Quality Points	
A	4.0	×	4	=	16.0
B	3.0	×	4	=	12.0
C	2.0	×	3	=	6.0
D	1.0	×	3	=	3.0
F	0.0	×	2	=	0.0
F B	3.0	×	2	=	6.0
I	—	×	—	=	—
ASC	—	×	—	=	—
		Totals	18		43.0

$$\text{Quality Point Average} = \frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$$

### **Academic Probation**

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

### **Disciplinary Action**

The Committee on Regulations and Discipline has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree, any student deemed unworthy because of conduct or character.

### **Auditing Policy**

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects and take tests and examinations for informal evaluation, if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

### **The I Grade**

The I grade may be given only when the student fails to take the final examination.

An instructor may decide that a student has done so poorly in the course that even a perfect grade in a makeup final could not raise the grade from F, in which case F is the proper grade, irrespective of the missed final.

If the student fails to complete some other major portion of the course work (examination, quizzes, major paper, etc.) a letter grade (A, B, C, D, F) should be assigned. This grade can be changed, upon petition, when the deficiency which led to the assigned letter grade is made up to the satisfaction of and in the manner prescribed by the instructor.

All deficiencies must be made up in the prescribed manner no later than the quarter following the recording of the grade.

# tuition and fees

Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be drawn to the order of North-eastern University.

## **Initial Registration Fee**

The University initial registration fee of \$10.00 is to be paid at the time of first billing. This fee is nonrefundable.

## **Tuition**

Tuition for all credit courses is \$26.00 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate and on the basis of payment specified for each course.

Tuition for all credit courses is charged on the quarter basis and is payable at the beginning of each quarter.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

## **Tuition Budget Payment Plans**

Occasionally situations develop—usually beyond the control of the student—which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally at the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if the student enters late. A charge of \$2.00 will be made. Failure to take immediate action will result in a late payment fee of \$10.00.

### **Tuition Underwritten by Employers**

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

### **Veterans' Benefits**

Any veteran covered by Public Law 89-358 should report to Room 245 Richards Hall to fill out the proper enrollment forms.

### **Late Payment Fee**

Bills for tuition and fees are payable on or before Saturday of the week of issuance. A late payment fee of \$10.00 is charged for all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

### **Refund of Tuition**

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

official withdrawal filed within:	percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

### **Courses in Other Departments of the University**

University College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

### **Student Center Fee**

All students in University College on the Huntington Avenue Campus are charged \$.75 each quarter for the services available in the Student Center.

**Graduation Fee**

The University graduation fee, charged to those who are candidates for the baccalaureate or associate degree, is \$25.00 payable on or before May 1 of the year in which the student expects to graduate.

**Transcripts**

Students may request transcripts of their grades at the Registrar's Office. There is no charge for the first transcript. After the initial transcript, there is a charge of \$1.00 per copy, payable in advance. If more than one transcript is requested at one time, the charge is \$1.00 for the first copy and \$.50 for each additional copy.



# financial aid

*General information pertaining to financial aid opportunities for adult part-time students is available in the University College Office, Room 102, Churchill Hall.*

*The following scholarships and awards are available to students enrolled in University College.*

## **Professor Joseph A. Mullen Scholarships**

The Massachusetts Chapter of the American Society of Training and Development has established a fund to provide annual scholarship awards to deserving part-time students upon the recommendation of the Dean of University College.

## **Dean Russell Whitney Memorial Scholarship**

Alpha Chapter of the Pi Tau Kappa Fraternity sponsors an annual tuition scholarship in memory of former Dean Russell Whitney. The award is made available to the man in University College whose qualities of leadership and influence on his fellow students, strength of character, and record of scholarship and broad achievement mark him as outstanding. The award is made available to the student who has completed a minimum of 80 quarter hours. To be eligible for this scholarship, the student must pursue a normal schedule during the year in which the award is made.

## **Martin Luther King Jr. Scholarships**

Established in 1969 in memory of the late Rev. Martin Luther King Jr. Awards are made as openings occur to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter.

## **Kappa Tau Phi Scholarships**

Kappa Tau Phi Sorority annually makes available scholarship awards. They are granted to women students in the liberal arts, business, and engineering



programs, respectively, who rank highest in their class at the end of the upper-middle year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the Bachelor's degree. In determining this award, grades of all courses completed in prior years shall be considered.

#### **Harry Olins Scholarship**

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the faculty, makes available an annual tuition award to two students who in terms of scholastic achievement, character, and personal need best typify the spirit of Northeastern University.

To be eligible for this award, the student must be a degree candidate and carry a full academic load during the school year.

#### **Pilot Freight Carriers Scholarships**

Pilot Freight Carriers, Winston-Salem, North Carolina, awards \$500 annually to advanced transportation students who have achieved high academic standing and who have paid their tuition expenses without prior aid. The award may be shared by more than one student. Potential recipients are designated by the Director of the Transportation Institute, and a final determination is made by the Dean of University College.

#### **University College Faculty Club Memorial Scholarship Awards**

The Faculty Club of University College, Northeastern University, offers two awards annually, primarily for excellence in studies, to Bachelor of Science degree candidates in University College who have carried, and are currently carrying, a minimum of 24 quarter hours annually. Applications available in December in U.C. offices. Must be returned before Feb. 1.

These awards shall be known as University College Faculty Club Memorial Scholarship Awards in commemoration of the Club's deceased members.

#### **Traffic Club of New England Scholarship**

The Traffic Club of New England provides 12 basic and four advanced scholarships annually for persons employed in transportation and industry traffic departments. The scholarships are divided equally between industry and carrier applicants, and each award is applicable toward tuition, books, and incidental expenses involved in Transportation Management courses. The purpose of the plan is to afford a limited number of young men an opportunity to expand and improve their education by systematized study in courses in the field of transportation and traffic management. The scholarships are administered cooperatively with the Scholarship Committee of the Traffic Club of New England. Applications may be secured from and filed with the Secretary, The Traffic Club of New England, 294 Washington Street, Boston, Massachusetts 02108.

**Sigma Epsilon Rho Scholarships**

University College's scholastic honor fraternity, Sigma Epsilon Rho, annually awards plaques and scholarships for outstanding scholastic achievement to the highest-ranking male students in University and Lincoln Colleges at the end of their junior year.

**University Scholarships**

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. Applicants must complete the same form used for the National Defense Student Loan Program and file it with the Office of Financial Aid one month prior to the start of the quarter. All applications will be considered for all scholarship and loan programs administered by the University unless an applicant specifies otherwise.

**National Defense Student Loan Program**

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one-half of the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$1,000. The total of loans made to a student for all years, including any made to him as a graduate student, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date on which the borrower ceases to carry, at an institution of higher education, at least one-half the normal full-time academic work load as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and application forms are available through the University College Office or from the Office of Financial Aid. For full-time

students, the deadline for application is August 1, and for half-time students, one month prior to the start of the quarter for which aid is requested.

### **Guaranteed Loan Program**

The major objective of this program is to make loan insurance available to any college student who wants to borrow. Under this program a student enrolled for at least one-half the normal academic work load may borrow from a bank or other financial institution. A graduate student may borrow as much as \$1,500 a year; an undergraduate, as much as \$1,000.

A student from a family with an adjusted income of less than \$15,000 a year pays no interest while he is in the University. Repayment of principal and interest begins when the student has ceased his course of study. At that time the Federal Government pays approximately one-half the interest and the student the remainder. A student from a family with an adjusted income higher than \$15,000 a year pays the entire interest on the loan, but he may borrow under the Guaranteed Loan Program at 6 per cent simple interest.

Students may obtain additional information and the necessary application forms from their local bank or other financial institution.

### **Veterans' Benefits**

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 245 Richards Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement Programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

### **Law Enforcement Assistance Administration**

The Law Enforcement Assistance Administration, U.S. Department of Justice, has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University loans up to \$1800 per year for tuition and grants up to \$200 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at federal, state, or local level.

The grants are available to full-time or part-time students in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of the government agency employing such applicant for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid, Room 252 Richards Hall.

# student activities

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of Adult Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College, Lincoln College, and the Graduate Schools are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of Adult Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The Adult Student Activities Office is located in 102 Churchill Hall.

## **Purpose**

The purposes of part-time student activities are:

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family, as an important and vital motivating force, in the part-time student's educational career.

## **Society for the Advancement of Management**

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management profession.

The Northeastern University part-time student chapter brings together business executives and students who are interested in the art and science of management. Meetings, conferences, and seminars provide an effective medium for the exchange and distribution of information on the problems, policies, and methods of management and industry.

### **Sigma Epsilon Rho Honor Fraternity**

Sigma Epsilon Rho is the honor fraternity of University College. Its purposes are:

To promote acquaintance and good fellowship among those men who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment through the bearing, influence, and work of these selected men.

To develop methods of mutual improvement and advancement among the members of this fraternity.

To support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the fraternity. Admission is by invitation after nomination by the fraternity.

An outstanding book is awarded each year by Sigma Epsilon Rho Fraternity to the highest-ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

### **Pi Tau Kappa Fraternity**

Pi Tau Kappa is a social fraternity open to all part-time students. It is organized to further the interests of students in their education, to promote closer affiliation between the student and the University, and to promote the social welfare of the adult student.

### **Kappa Tau Phi Sorority**

Kappa Tau Phi Sorority is a social organization open to all part-time women students. Its purpose is to promote fellowship among the women students so that they may become better acquainted and form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

### **Lambda Alpha Epsilon**

Lambda Alpha Epsilon is a national law enforcement fraternity founded in 1957. The Northeastern Chapter Kappa Phi Beta is open to part-time and

day students enrolled in Law Enforcement and Security Programs, and also to professional men in the fields of law enforcement and security. The fraternity is dedicated to the furtherance of professional standards in law enforcement.

### **Lamplighter**

*Lamplighter* is the news publication serving part-time students. Any student who is interested in working on this publication should communicate with the Lamplighter Adviser in Room 102 Churchill Hall.

### **Adult Student Council**

The Adult Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and the administrative staff.

The Adult Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The A.S.C., a member of the United States Association of Evening Students, meets on the first Monday of each month at 8:30 p.m. in the Student Center. Students are welcome to visit, observe, and express opinions concerning part-time student life.

### **Use of Gymnasium Facilities**

Specific schedules for use of the Pool, Weight Training Room, Indoor Athletic Field and Track, Handball Courts, Gymnasium, and Wrestling Room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a Gymnasium Privilege Card and sign a Medical Release form in the Office of Adult Student Activities, Room 102 Churchill Hall.

Students using the Cabot Gymnasium Complex must abide by the General Policies set forth for all students regarding these facilities.

### **Interest Groups and Clubs**

Interest Groups and Clubs meeting on a weekly or biweekly basis are: Electrical, Mechanical, and Civil Engineering, Skiing, Medical Technology, Computer, Physical Fitness, and Psychology. Anyone wishing to participate should contact the Activities Office in the Student Center.

### **Placement Service**

Whenever students or graduates request the College to assist them in securing new opportunities for development or advancement, the College



will endeavor to put them in touch with employers who may have asked the College to assist them in finding employees with the qualities and potential required. While the College cannot guarantee positions to either its undergraduates or graduates, it will do what it can to bring applicants and employers together to their possible mutual satisfaction. In the final analysis, placement depends largely on the applicant's ability to sell his services. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling positions at all levels.

No charge is made for placement service.

### **Alumni Association**

More than 40,000 alumni are members of the all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, The Northeastern University ALUMNUS, is published quarterly and sent free of charge to all alumni on record.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in Lincoln and University Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct

various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.





# programs of study

University College conducts part-time educational programs at the undergraduate level during day and evening hours. The programs are designed to meet the varying needs and interests of adult students who may enroll as (1) *Regular* students following degree programs or as (2) *Special* students taking single courses or special programs.

University College programs leading to the Bachelor of Science degree provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The Bachelor of Science degree requires 174 quarter hours of credit.

Programs leading to the Associate in Science degree provide students a background in fundamental areas in business administration, liberal arts, health-related programs, and law enforcement. The Associate degree requires 96 quarter hours of credit and is equivalent to the conventional two-year, or junior college in scope and quality.

Degree curricula are offered in the following areas:

## BUSINESS ADMINISTRATION

Major	Degree	Page
Business Administration	Associate in Science	53
Electronic Data Processing	Associate in Science	55
Purchasing	Associate in Science	57
Real Estate	Associate in Science	59
Accounting	Bachelor of Science	61
Finance	Bachelor of Science	62
Industrial Management	Bachelor of Science	63
Industrial Technology	Bachelor of Science	64
Insurance	Bachelor of Science	65
Management	Bachelor of Science	66
Management Information Systems	Bachelor of Science	67
Marketing	Bachelor of Science	68
Personnel and Industrial Relations	Bachelor of Science	69

## 50 / PROGRAMS OF STUDY

Transportation and Physical Distribution Management	Bachelor of Science	70
Combined Program in Liberal Arts and Management	Bachelor of Science	71

### LIBERAL ARTS

Major	Degree	Page
Economics	Bachelor of Science	76
English	Bachelor of Science	77
Fine Arts	Bachelor of Science	78
History	Bachelor of Science	80
Liberal Arts	Associate in Science	83
Music	Bachelor of Science	91
Political Science	Bachelor of Science	84
Psychology	Bachelor of Science	86
Sociology-Anthropology	Bachelor of Science	88

### LAW ENFORCEMENT

Major	Degree	Page
Correctional Practices	Bachelor of Science	94
	Associate in Science	98
Law Enforcement	Bachelor of Science	100
	Associate in Science	104
Security	Bachelor of Science	106
	Associate in Science	110

### HEALTH-RELATED PROGRAMS

Major	Degree	Page
<b>Forsyth School—Northeastern University Affiliated Program</b>		
Program for Dental Hygienists	Bachelor of Science	112
	Health Sciences	
Respiratory Therapy	Associate in Science	123
Management in Health Agencies and Institutions	Bachelor of Science	114
Medical Records Science	Bachelor of Science	118
	Certificate	121
Nursing Home Administration	Selected courses—no degree	117
<b>Lincoln College—University College Affiliated Programs</b>		
Chemical-Biological Technology	Bachelor of Science	126
Cytotechnology	Bachelor of Science	128
Medical Technology	Bachelor of Science	130

### EDUCATION

Major	Degree	Page
Teaching of English (in grades 7–12)	Bachelor of Science	132

Course descriptions are listed in numerical order by department beginning on page 137.

# business administration

## Aims

Business Administration programs of study are offered to meet the needs of adult men and women who wish to acquire professional competence in their chosen field of business. Our degree programs are designed to build for the student both a breadth of perspective and a degree of specialization. The former is obtained through a strong and well-balanced sequence of liberal arts courses which emphasize our fundamental economic laws and the social and cultural foundations of American society. The latter is obtained by a study of the basic business courses in addition to a concentrated study in the major business area selected by the student.

## Requirements

### Associate in Science Degree

The Associate in Science degree is offered in the following fields of study: Business Administration, Electronic Data Processing, Purchasing, and Real Estate. To qualify for the associate degree 96 quarter hours must be successfully completed in one of the four associate programs. Detailed information on these programs together with a recommended sequence for completing them appears on the following pages.

### New Students—Please Note:

In an effort to achieve a certain level of analytic and academic sophistication among students taking upper level business administration courses (designated by an asterisk wherever they appear in the catalog), University College instituted a new procedure in the Fall Quarter of 1969 whereby all new students are required to successfully complete an appropriate associate degree program before they become eligible to take upper level business administration courses. Special students (students not pursuing a degree program) may take upper level courses if they can demonstrate to a program adviser (always present during registration) or to one of the deans in University College that they have an adequate background to cope with upper level course content. In determining whether a student has "an adequate background," the program advisers and the deans will evaluate, but not be

limited to, such factors as work experience, former college work, independent study, etc.

The "appropriate" program for all bachelor degree students, except the Management Information Systems (MIS) degree student, is the Associate degree program in Business Administration. The "appropriate" program for the MIS degree student is the Associate degree program in Electronic data Processing (EDP). Students pursuing one of the other associate programs or students pursuing an "inappropriate" associate program (e.g., student following EDP Associate program who wants to major in finance in his bachelor's program) may make special arrangements with the Dean of Admissions or the Director of Business Programs for a bachelor's program.

A student with a 2.0 average or better in an associate degree program will be considered by University College as having "successfully completed" the program. It should be noted that students do not have to formally receive associate degrees; successful completion of the associate degree program (or demonstration of an "adequate background" in the case of special students) is all that is necessary for entry into upper level business administration courses.

### **The Bachelor of Science Degree**

The Bachelor of Science degree in Business Administration is offered in the following fields of study: Accounting, Finance, Industrial Management, Industrial Technology, Insurance, Management, Management Information Systems, Marketing, Personnel and Industrial Relations, Transportation and Physical Distribution Management, and in the Combined Program in Liberal Arts and Management.

In general, the Bachelor of Science degree requires successful completion of the following areas of study:

<b>Liberal Arts</b>	<b>quarter hours</b>
Basic Courses and Electives	70
<b>Business Administration</b>	
Basic courses	66
Major Field of Study	30
Electives (Business Administration or Liberal Arts)	8
<b>Total</b>	<b>174</b>

Detailed information on these programs appears on the following pages.

### **English Requirements**

The English requirements shall be fulfilled by taking Composition and Rhetoric I, II (30.601, 30.602), Introduction to Literary Forms I, II (30.604, 30.605) and four additional hours of literature. Please review the appropriate detailed program information. For new English requirements see explanation on page 176.

**BUSINESS ADMINISTRATION****Associate in Science Degree**

quarter hours

**Basic Courses—Liberal Arts**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
16.501,	16.502,	16.503	Natural Science I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	44
				—	

**Basic Courses—Business Administration**

41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions & Risk		
45.501,	45.502,	45.503	Management & Organization I, II, III	6	
45.506,	45.507,	45.508	Production Management and Manufacturing Systems I, II, III	6	
45.501,	45.502,	45.503	Management & Organization I, II, III	4	
	45.510,	45.511	Labor Management Relations I, II	4	
	45.511,	45.512	Human Relations in Organizations I, II	4	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
		45.573	Basic Computer Programming	2	
		45.667	Project Planning and Control	2	46
				—	
<b>Electives</b>			Literature	4	6
			Elective	2	

<b>Total Credits</b>		<b>96</b>
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Students following a degree program should refer to suggested course sequence on the opposite page.

## BUSINESS ADMINISTRATION

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter I</b>	<b>Quarter II</b>	<b>Quarter III</b>
<b>1st Year</b>	Comp. & Rhet. I Accounting I Mgmt. & Org. I Nat. Science I	Comp. & Rhet. II Accounting II Mgmt. & Org. II Nat. Science II	Elective Accounting III Mgmt. & Org. III Nat. Science III
<b>2nd Year</b>	Economics I Math. I Marketing I Cap. Inst. I	Economics II Math. II Marketing II Cap. Inst. II	Economics III Math. III Marketing III Cap. Inst. III
<b>3rd Year</b>	West. Civ. I Psych. I E.D.P. I Labor Mgmt. I	West. Civ. II Psych. II E.D.P. II Labor Mgmt. II	West. Civ. III Psych. III E.D.P. III Elective
<b>4th Year</b>	Intro. Lit. Forms I Stat. I Prod'n Mgmt. I Hum. Rel. I	Intro. Lit. Forms II Stat. II Prod'n Mgmt. II Hum. Rel. II	Project Planning Stat. III Prod'n Mgmt. III Basic Computer Programming

**ELECTRONIC DATA PROCESSING****Associate in Science Degree**

quarter hours

**Basic Courses—Liberal Arts**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
16.501,	16.502,	16.503	Natural Science I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
29.501,	29.502,	29.503	Effective Speaking I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	44
				—	

**Basic Courses—Business Administration**

41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	24
				—	

**Major Field of Study**

10.504,	10.505,	10.506	Mathematics for Business Management I, II, III	6	
		45.573	Basic Computer Programming	2	
	45.574,	45.575	Computer Programming for Business I, II	4	
		45.577	Data Systems Administration	2	
	45.578,	45.579	Business Data Processing Applications I, II	4	
		45.667	Project Planning and Control	2	26
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6	
Electives			Liberal Arts	2	2
				—	
<b>Total Credits</b>					<b>96</b>

Students following a degree program should refer to suggested course sequence on the opposite page.

## ELECTRONIC DATA PROCESSING

Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I E.D.P. I Mgmt. & Org. I Math. I	Comp. & Rhet. II E.D.P. II Mgmt. & Org. II Math. II	Elective E.D.P. III Mgmt. & Org. III Math. III
2nd Year	Economics I Accounting I Math. for Bus. Mgmt. I Basic Comp. Prog.	Economics II Accounting II Math. for Bus. Mgmt. II Comp. Prog. Bus. I	Economics III Accounting III Math. for Bus. Mgmt. III Comp. Prog. Bus. III
3rd Year	Cap. Inst. I Psych. I Sys. Des. Tech. I Stat. I	Cap. Inst. II Psych. II Sys. Des. Tech. II Stat. II	Cap. Inst. III Psych. III Sys. Des. Tech. III Stat. III
4th Year	Intro. to Lit. Forms I Effective Spking. I Bus. Data Proc. Appl. I Nat. Science I	Intro. to Lit. Forms II Effective Spking. II Bus. Data Proc. Appl. II Nat. Science II	Project Planning Effective Spking. III Data Sys. Adm. Nat. Science III



**PURCHASING****Associate in Science Degree**

quarter hours

**Basic Courses—Liberal Arts**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	32
				—	

**Basic Courses—Business Administration**

41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	24
				—	

**Major Field of Study**

		43.520	Industrial Marketing	2	
	45.510,	45.611	Labor Management Relations I, II	4	
	45.511,	45.512	Human Relations in Organizations I, II	4	
		45.536	Principles of Material Inspection	2	
45.537,	45.538,	45.539	Purchasing I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	
45.623,	45.624,	45.625	Manufacturing Processes I, II, III	6	
	45.627,	45.628	Value Management I, II	4	
		45.626	Professional Purchasing Techniques*	2	36
Electives			Literature	4	4
				—	
			<b>Total Credits</b>		<b>96</b>

Students following a degree program should refer to suggested course sequence on the opposite page.

\*Upper level Business Administration course; may be taken in the Purchasing Associate Degree Program.

**PURCHASING****Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter I</b>	<b>Quarter II</b>	<b>Quarter III</b>
<b>1st Year</b>	Comp. & Rhet. I Accounting I Mgmt. & Org. I Math. I	Comp. & Rhet. II Accounting II Mgmt. & Org. II Math. II	Elective Accounting III Mgmt. & Org. III Math. III
<b>2nd Year</b>	Economics I Psych. I Cap. Inst. I E.D.P. I	Economics II Psych. II Cap. Inst. II E.D.P. II	Economics III Psych. III Cap. Inst. III E.D.P. III
<b>3rd Year</b>	Intro. to Lit. Forms I Stat. I Purchasing I Manuf. Proc. I	Intro. to Lit. Forms II Stat. II Purchasing II Manuf. Proc. II	Elective Stat. III Purchasing III Manuf. Proc. III
<b>4th Year</b>	Law I Labor Mgt. Rel. I Hum. Rel. I Prof. Purchasing	Law II Labor Mgt. Rel. II Hum. Rel. II Value Mgmt. I	Law III Industrial Mktg. Prin. Mat. Inspec. Value Mgmt. II

**REAL ESTATE**

**Associate in Science Degree**

quarter hours

**Basic Courses—Liberal Arts**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	<b>38</b>
				—	

**Basic Courses—Business Administration**

41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	<b>24</b>
				—	

**Major Field of Study**

47.501,	47.502,	47.503	Real Estate Fundamentals I, II, III	6	
	47.508,	47.509	Real Estate Financial Analysis I, II	4	
		47.511	Fundamental Real Estate Appraisal I, II	2	
	47.512,	47.513	Advanced Real Estate Appraisal I, II	4	
		47.521	Real Estate Development	2	<b>18</b>
				—	

**Electives**

Literature	4	
Liberal Arts	6	
Business Administration	6	<b>16</b>
		—

**Total Credits 96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

**Additional Department Offerings**

47.524	Private Real Estate Law	2
47.525	Public Real Estate Law	2

Please see page 213 for course description.

\*Upper level Business Administration course; may be taken in the Real Estate Associate Degree program.

**REAL ESTATE****Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter I</b>	<b>Quarter II</b>	<b>Quarter III</b>
<b>1st Year</b>	Comp. & Rhet. I Accounting I Mgmt. & Org. I Math. I	Comp. & Rhet. II Accounting II Mgmt. & Org. II Math. II	Elective Accounting III Mgmt. & Org. III Math. III
<b>2nd Year</b>	Economics I Law I Cap. Inst. I R.E. Fund. I	Economics II Law II Cap. Inst. II R.E. Fund. II	Economics III Law III Cap. Inst. III R.E. Fund. III
<b>3rd Year</b>	Psych. I Stat. I R.E. Fin. Anal. I Elective	Psych. II Stat. II R.E. Fin. Anal. II Elective	Psych. III Stat. III R.E. Development Elective
<b>4th Year</b>	Intro. to Lit. Forms I Fund. R.E. App. Elective Elective	Intro. to Lit. Forms II Adv. R.E. App. I Elective Elective	Elective Adv. R.E. App. II Elective Elective

**ACCOUNTING****Bachelor of Science Degree**

				quarter hours	
<b>Associate Degree Program</b>				<b>96</b>	
<b>Core Courses—Liberal Arts</b>					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	12
				—	
<b>Core Courses—Business Administration</b>					
41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6	
41.507,	41.508,	41.509	Accounting—Cost I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	24
				—	
<b>Major Concentration Courses</b>					
41.510,	41.511,	41.512	Accounting—Advanced I, II, III*	6	
41.513,	41.514,	41.515	Accounting—Specialized Problems I, II, III*	6	
41.516,	41.517,	41.518	Auditing I, II, III*	6	
41.519,	41.520,	41.521	Federal Income Taxes I, II, III*	6	
41.522,	41.523,	41.524	Seminar in Contemporary Accounting Problems I, II, III*	6	30
				—	
<b>Electives</b>					
				Liberal Arts	10
				Business Administration or Liberal Arts	2
				—	12
<b>Total Credits</b>					<b>174</b>
<b>Additional Department Offerings</b>					
		41.525	Estate and Gift Taxes	2	
	41.526,	41.527	Corporate and Stockholder Tax Problems I, II	4	

Please see page 190 for course descriptions.

\*Upper level Business Administration course—see p. 51.

**FINANCE****Bachelor of Science Degree**

quarter hours

**Associate Degree Program****96****Core Courses—Liberal Arts**

21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	18
				—	

**Core Courses—Business Administration**

41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
44.521,	44.522,	44.523	Credit Management I, II, III*	6	
45.541,	45.542,	45.543	Law I, II, III*	6	
47.501,	47.502,	47.503	Real Estate Fundamentals I, II, III	6	30
				—	

**Major Concentration Courses**

		44.513	Estate Planning*	2	
44.517,	44.518,	44.519	Investments I, II, III*	6	
	44.531,	44.532	Seminar in Finance I, II*	4	
		44.544	Law of Finance*	2	
	47.508,	47.509	Real Estate Financial Analysis I, II	4	18
				—	

**Electives**

Liberal Arts	4	
Business Administration or Liberal Arts	8	12
	—	
<b>Total Credits</b>		<b>174</b>

\*Upper level Business Administration course—see p. 51.

**INDUSTRIAL MANAGEMENT****Bachelor of Science Degree**

quarter hours

<b>Associate Degree Program</b>					<b>96</b>
<b>Core Courses—Liberal Arts</b>					
10.504,	10.505,	10.506	Mathematics for Business Management I, II, III	6	
11.304,	11.305,	11.306	General Physics I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	<b>24</b>
				—	
<b>Core Courses—Business Administration</b>					
45.533,	45.534,	45.535	Management Decisions and Policies I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	
	45.574,	45.575	Computer Programming for Business I, II	4	<b>16</b>
				—	
<b>Major Concentration Courses</b>					
		45.519	Work Methods	2	
		45.528	Work Measurement	2	
	45.561,	45.562	Statistical Quality Control I, II	4	
		45.563	Management of Quality Control	2	
45.595,	45.596,	45.597	Manufacturing Seminar I, II, III*	6	
45.623,	45.624,	45.625	Manufacturing Processes I, II, III	6	
	45.636,	45.637	Production and Inventory Control I, II*	4	
45.638,	45.639,	45.640	Industrial Decision Making I, II, III*	6	<b>32</b>
				—	
<b>Electives</b>			(Liberal Arts or Business Administration)		<b>6</b>
					<hr/>
<b>Total Credits</b>					<b>174</b>
<b>Additional Department Offerings</b>					
		45.522	Job Evaluation	2	
	45.526,	45.431	Facilities Planning and Design I, II	4	
		45.530	Standard Data Development	2	
45.537,	45.538,	45.539	Purchasing I, II, III	6	
		45.620	Industrial Safety	2	
		45.626	Professional Purchasing Techniques	2	
	45.627,	45.628	Value Management I, II	4	
45.670,	45.671,	45.672	Management of Change I, II, III	6	

Please see page 200 for course descriptions.

\*Upper level Business Administration course—see p. 51.

**INDUSTRIAL TECHNOLOGY****Bachelor of Science Degree**

				quarter hours	
<b>Engineering or Science Technology Courses</b>				<b>96</b>	
<b>Core Courses—Liberal Arts</b>					
19.501,	19.502,	19.503	Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	
<b>Core Courses—Business Administration</b>					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
	43.501,	43.502	Introduction to Marketing I, II	4	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.510,	45.611	Labor-Management Relations I, II	4	
45.541,	45.542,	45.543	Law I, II, III*	6	
	45.561,	45.562	Statistical Quality Control I, II	4	
		45.563	Management of Quality Control	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
	45.623,	45.624	Manufacturing I, II	4	42
<b>Electives</b>				4	4
				—	
<b>Total Credits</b>					<b>174</b>

\*Upper level Business Administration course—see p. 51.



**INSURANCE****Bachelor of Science Degree**

				quarter hours	
<b>Associate Degree Program</b>				<b>96</b>	
<b>Core Courses—Liberal Arts</b>					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	18
				—	
<b>Core Courses—Business Administration</b>					
	44.511,	44.512	Life Insurance I, II	4	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	16
				—	
<b>Major Concentration Courses</b>					
		44.513	Estate Planning*	2	
	44.525,	44.526	Health and Social Insurance I, II*	4	
		44.527	Business and Group Insurance and Pensions	2	
		44.529	Advanced Property Insurance*	2	
		44.530	Advanced Property—Casualty Insurance*	2	
	44.540,	44.541	Advanced Risk Analysis and Treatment I, II*	4	
		44.543	Law of Insurance*	2	18
				—	
<b>Electives</b>					
			Liberal Arts	4	
			Business Administration or Liberal Arts	22	26
				—	
<b>Total Credits</b>					<b>174</b>

\*Upper level Business Administration course—see p. 51.

**MANAGEMENT****Bachelor of Science Degree**

				quarter hours	
<b>Associate Degree Program</b>					<b>96</b>
<b>Core Courses—Liberal Arts</b>					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.511,	30.512,	30.513	Business Writing and Reports I, II, III	6	
39.531,	39.532,	39.533	Business Cycles I, II, III	6	24
				—	
<b>Core Courses—Business Administration</b>					
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	12
				—	
<b>Major Concentration Courses</b>					
19.532,	19.533,	19.534	Industrial Psychology I, II, III*	6	
41.533,	41.534,	41.535	Accounting for Management		
Decisions I, II, III				6	
43.507,	43.508,	43.509	Sales Management I, II, III	6	
45.523,	45.524,	45.525	Management Seminar I, II, III*	6	
45.533,	45.534,	45.535	Management Decisions and		
Policies I, II, III*				6	30
				—	
<b>Electives</b>			Business Administration or Liberal Arts		<b>12</b>
				<b>Total Credits</b>	<b>174</b>
<b>Additional Department Offerings</b>					
	45.504,	45.604	Administrative Management and		
			Office Services I, II	4	
		45.667	Project Planning and Control	2	
	49.504,	49.505	Strategy for Planning I, II	6	
45.670,	45.671,	45.672	Management of Change I, II, III	6	

Please see page 198 for course descriptions.

\*Upper level Business Administration course—see p. 51.

# MANAGEMENT INFORMATION SYSTEMS Bachelor of Science Degree

				quarter hours	
<b>Associate Degree Program</b>				<b>96</b>	
<b>Core Courses—Liberal Arts</b>					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.511,	30.512,	30.513	Business Writing and Reports I, II, III	6	18
				—	
<b>Core Courses—Business Administration</b>					
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
	45.510,	45.611	Labor Management Relations I, II	4	
	45.511,	45.512	Human Relations in Organizations I, II	4	
45.541,	45.542,	45.543	Law I, II, III*	6	26
				—	
<b>Major Concentration Courses</b>					
45.589,	45.590,	45.591	Advanced Systems Design I, II, III*	6	
45.592,	45.593,	45.594	Advanced Systems Techniques I, II, III*	6	
		45.630	Introduction to Operations Research	2	
	45.631,	45.632	Operations Research Applications I, II*	4	
	45.668,	45.669	Peripheral Systems Techniques I, II	4	22
				—	
<b>Electives</b>					
				Liberal Arts	2
				Business Administration or Liberal Arts	10
				<b>Total Credits</b>	<b>174</b>
<b>Additional Department Offerings</b>					
	45.574,	45.575	Computer Programming for Business I, II	4	
	45.583,	45.683	Computer Programming for Scientific Applications I, II	4	
	45.516,	45.653	Government Data Processing Applications I, II	4	
45.617,	45.618,	45.619	Advanced Computer Programming I, II, III	6	
	45.655,	45.656	Auditing Data Processing Applications I, II	4	
	45.658,	45.659	Retailing Data Processing Applications I, II	4	
	45.661,	45.662	Banking Data Processing Applications I, II	4	
	45.664,	45.665	EDP in Property and Casualty Insurance I, II	4	
45.677,	45.678,	45.679	Operating Systems I, II, III	6	
45.680,	45.681,	45.682	Computer Communications Systems Design I, II, III	6	
	49.504,	49.505	Strategy for Planning I, II	6	

Please see page 207 for course descriptions.

\*Upper level Business Administration course—see p. 51.

**MARKETING****Bachelor of Science Degree**

quarter hours

**Associate Degree Program****96****Core Courses—Liberal Arts**

21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	12
				—	

**Core Courses—Business Administration**

43.518,	43.519,	43.522	Retailing I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	12
				—	

**Major Concentration Courses**

43.507,	43.508,	43.509	Sales Management I, II, III	6	
43.511,	43.512,	43.513	Creative Marketing Communications I, II, III	6	
		43.520	Industrial Marketing	2	
	43.525,	43.526	Market Research I, II*	4	
		43.529	International Marketing	2	
43.532,	43.533,	43.534	Marketing Management I, II, III*	6	
		43.537	Marketing and Sales Seminar*	2	28
				—	

**Electives**

Liberal Arts	10	
Business Administration or Liberal Arts	16	26
	—	

**Total Credits****174****Additional Department Offerings**

	43.536	Advertising Techniques	2
43.541,	43.542	Public Relations I, II	4
49.504,	49.505	Strategy for Planning I, II	6

Please see page 193 for course descriptions.

\*Upper level Business Administration course—see p. 51.

**PERSONNEL AND INDUSTRIAL RELATIONS      Bachelor of Science Degree**

				quarter hours	
<b>Associate Degree Program</b>				<b>96</b>	
<b>Core Courses—Liberal Arts</b>					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	12
				—	
<b>Core Courses—Business Administration</b>					
45.541,	45.542,	45.543	Law I, II, III*	6	6
				—	
<b>Major Concentration Courses</b>					
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
		45.517	Techniques of Employee Selection	2	
		45.518	Wage and Salary Administration*	2	
		45.521	Employee Benefits and Social Security	2	
		45.522	Job Evaluation	2	
		45.545	Law of Employment Standards*	2	
		45.546	Law of Employment Conditions*	2	
		45.548	Law of Labor Management Relations*	2	
		45.553	The Labor Agreement*	2	
		45.556	Negotiation, Mediation, Arbitration*	2	
		45.560	Seminar on Labor Issues*	2	26
				—	
<b>Electives</b>					
				Liberal Arts	10
				Business Administration or Liberal Arts	24
					<b>34</b>
				<b>Total Credits</b>	<b>174</b>
<b>Additional Department Offerings</b>					
		45.557	International Labor Movements	2	
45.670,	45.671,	45.672	Management of Change I, II, III	6	
	49.504,	49.505	Strategy for Planning I, II	6	

Please see page 203 for course descriptions.

\*Upper level Business Administration course—see p. 51.

**TRANSPORTATION AND PHYSICAL  
DISTRIBUTION MANAGEMENT**
**Bachelor of Science Degree**

				quarter hours	
<b>Associate Degree Program</b>					<b>96</b>
<b>Core Courses—Liberal Arts</b>					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	12
				—	
<b>Core Courses—Business Administration</b>					
45.541,	45.542,	45.543	Law I, II, III*	6	
48.501,	48.502,	48.503	Transportation Management I, II, III	6	
48.511,	48.512,	48.513	Railroad and Ocean Transportation I, II, III	6	
48.517,	48.518,	48.519	Motor Carrier Management I, II, III	6	24
				—	
<b>Major Concentration Courses</b>					
48.504,	48.505,	48.506	Transportation Regulation and Promotion I, II, III	6	
48.521,	48.522,	48.523	Physical Distribution Management I, II, III*	6	
48.524,	48.525,	48.526	Transportation Economics and Rate Making I, II, III*	6	
48.541,	48.542,	48.543	Air Transportation I, II, III	6	
48.544,	48.545,	48.546	Urban Transportation I, II, III	6	30
				—	
<b>Electives</b>					
				Liberal Arts	10
				Business Administration or Liberal Arts	2
				—	12
<b>Total Credits</b>					<b>174</b>

\*Upper level Business Administration course—see p. 51.

**COMBINED PROGRAM IN LIBERAL ARTS  
AND MANAGEMENT**
**Bachelor of Science Degree**
**quarter hours**
**LIBERAL ARTS COURSES**
**Basic Courses**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses**

16.501,	16.502,	16.503	Natural Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U.S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in Translation	6	48
				—	

**Electives**

Literature	4	
Liberal Arts	18	22

**MANAGEMENT COURSES**
**Core Courses**

41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.510,	45.611	Labor Management Relations I, II	4	
	45.511,	45.512	Human Relations in Organizations I, II	4	
45.541,	45.542,	45.543	Law I, II, III*	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	50
				—	

**Electives—Business Administration**
**22**
**Total Credits**
**174**

\*Upper level Business Administration course—see p. 51.

# liberal arts

## Aims

In providing the means to a modern liberal education, University College has the main objective of stimulating and guiding the self-development of the student in three main areas: first, his intellectual growth; second, the development of his character and sense of values; and, third, his preparation for, or advancement in, a career.

Intellectual growth—the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the liberal arts curricula, students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

Through its many programs, University College endeavors to provide experiences conducive to the development of strength of character and a sense of personal responsibility, including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to the broadening and intensification of interests as the student becomes aware of his own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of himself and his career. His career brings meaning and focus to his educational experience. His education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills for himself.

## Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields.



Therefore, the Curriculum Committee of University College has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

### **Programs of Study**

To achieve the aims established for the programs in Liberal Arts, of serving men and women who are engaged in full-time employment during the day, the College offers curricula leading to the baccalaureate and associate degrees. The various individual courses of study are outlined on the following pages. Course descriptions are listed in numerical order by departments beginning on page 137.

### **The Bachelor of Science Degree**

Major fields of study are offered in Economics, English, Art, Political Science, History, Psychology, Sociology-Anthropology, and Music. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including specific required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific career objectives.

Each curriculum normally provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field, and at least 30 quarter hours of elective liberal arts courses.

All candidates for the Bachelor of Science degree must have satisfactorily completed in college one full year of a modern language beyond the elementary level.

No student transferring from another college or university is eligible to receive a degree until at least 40 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

### **The Associate in Science Degree**

The program leading to the associate degree is offered for those desiring a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree in Liberal Arts must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements (174 quarter hours) for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the several areas of

study as listed on page 83. For the purpose of satisfying the distribution requirements listed on that page:

*Math-Science* includes courses in Mathematics (10. . . .), Physics (11. . . .), Chemistry (12. . . .), Earth Science (16. . . .), Biology (18. . . .), and Psychology (lab. courses only) (19. . . .).

*Humanities* includes courses in Art (27. . . .), Speech and Theatre Arts (29. . . .), English (except *required*) (30. . . .), Journalism (38. . . .), Modern Languages (31. . . . to 34. . . .), Philosophy (26. . . .), and Music (28. . . .).

*Social Sciences* includes courses in Economics (39. . . .), History (23. . . .), Political Science (22. . . .), Psychology (except laboratory courses, 19. . . .), and Sociology-Anthropology (20. . . ., and 21. . . .).

### English Requirement

The 8 q.h. or *required* English\* must be taken prior to matriculation. These are required courses which can not be used to satisfy distribution requirements in any liberal arts course of study.

### Honors Program

An upperclass honors program is provided in University College to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program is determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration given to the individual needs and requirements of the student.

Students who have earned 96 quarter hours of credit toward their Bachelor of Science degree and who have a grade-point average of 3.0 or better are eligible to apply to the Director of Liberal Arts in University College for admission to the program. Acceptance as an honors candidate rests with the academic department concerned.

### Acceptance of Credits by the College of Liberal Arts\*\*

The College of Liberal Arts permits its students to enroll for credit in all courses in University College offered on a quarterly basis when they are pertinent to the student's program and have been approved by the Dean of the College of Liberal Arts. The credits for such courses may be applied:

\*For new English requirements see explanation on page 176.

\*\*One of the Basic (day) Colleges of Northeastern University.

1. To the total number of credits needed for graduation
2. To satisfy distribution requirements
3. To fulfill language and major deficiencies

Credits from University College, as well as those from other accredited institutions, may not, however, be applied to the quality point average of students in the College of Liberal Arts except when such credits are from courses taken as substitutes for those College of Liberal Arts courses failed by students. In such instances students must receive a grade of C or better in the University College courses and then only 2.0 quality points are applied to the student's record for each course.

#### **Transfer of Students to the College of Liberal Arts\***

Those students enrolled in University College who wish to transfer to the College of Liberal Arts must apply through the Department of Admissions of the Basic Colleges.

---

\*One of the Basic (day) Colleges of Northeastern University.

**ECONOMICS****Bachelor of Science Degree****Basic Courses—required**

quarter hours

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required**

16.501,	16.502,	16.503	Earth Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Mathematics				6	66
				—	

**Major Concentration Courses—required**

39.507,	39.508,	39.509	Intermediate Economic Theory I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	
	39.517,	39.518	Money and Banking	4	
		39.519	Public Finance	2	
		39.521	Economic Growth and Development I	2	
		39.523	Government and Business I	2	
		39.527	Labor Economics	2	
	39.528,	39.529	International Economics I, II	4	
		39.530	Comparative Economic Systems	2	
	39.531,	39.532	Business Cycles I, II	4	
		39.581	Economic Policy Seminar	2	
The remaining twelve hours must be taken from the following courses:					
		39.522	Economic Growth and Development II	2	
	39.524,	39.526	Government and Business II, III	4	
		39.525	American Economic History	2	
		39.533	Business Cycles III	2	
39.536,	39.537,	39.538	Advanced Statistics I, II, III	6	
		39.539	Managerial Economics	2	
		39.540	History of Economic Thought	2	
		39.551	Industrial Organization	2	
		39.561	Urban Economics	2	
		39.571	European Economic History	2	48
				—	

**Elective Courses\*\***

28

**Total Credits**

174

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**ENGLISH****Bachelor of Science Degree**

Basic Courses—required				quarter	hours
10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	
Core Courses—required					
16.501,	16.502,	16.503	Earth Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.531,	30.532,	30.533	Western World Literature I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	
Major Concentration Courses—required					
		29.525	Modern British Drama	}	2
			or		
		29.526	Modern American Drama	}	2
		30.517	Intermediate Writing		
		30.525	The English Language		2
		30.522	Introduction to Semantics I		2
30.534,	30.535,	30.536	Western World Literature IV, V, VI		6
30.541,	30.542,	30.543	English Literature I, II, III		6
30.544,	30.545,	30.546	American Literature I, II, III		6
30.551,	30.552,	30.553	Chaucer I, II, III	}	6
			or		
30.554,	30.555,	30.556	Shakespeare I, II, III	}	6
30.557,	30.558,	30.559	Restoration Literature, The Age of Pope and Swift, The Age of Johnson		
			or		
30.571,	30.572,	30.573	Romantic Poets of the 19th Century I, II, III		
The remaining eight hours must be taken from the following courses:					
		30.574	The 18th-Century English Novel		2
		30.575	The 19th-Century English Novel		2
		30.576	The 20th-Century English Novel		2
		30.581	The American Short Story		2
		30.582	The 19th-Century American Novel		2
		30.583	The 20th-Century American Novel		2
		30.584	Contemporary American Poetry		2
30.591,	30.592,	30.593	Honors Program I, II, III	12	46
				—	
Elective Courses**					30
					30
Total Credits					174

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

## FINE ARTS

Bachelor of Science Degree  
quarter hours

## Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
30.504,	30.505,	30.506	English I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	32
				—	

## Core Courses—required

16.501,	16.502,	16.503	Earth Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	

## Major Concentration Courses—required

27.504,	27.505,	27.506	Western Art I, II, III	6	
		27.591	Art Seminar (senior level)	2	

In addition to the two courses above, required of all Fine Arts majors, each student will select a minimum of 36 quarter hours from either Area I or Area II.

(continued on following page)

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Area I—Art History Major**

	27.507	Ancient Architecture	2
	27.508	Medieval and Renaissance Architecture	2
	27.509	European Architecture	2
27.510,	27.511	Ancient Painting and Sculpture I, II	2
	27.512	Medieval Painting and Sculpture	2
	27.513	Italian Renaissance Art	2
	27.514	European Painting	2
27.515, 27.516,	27.517	Modern Painting I, II, III	2
	27.518	20th Century American Architecture	2
	27.519	20th Century European Architecture	2
	27.521	Spanish Art	2
	27.522	French Art	2
	27.523	English Art	2
27.524, 27.525,	27.526	American Art I, II, III	2
27.531, 27.532,	27.533	Oriental Art I, II, III	2
	27.534	Russian Art	2
	27.535	African Art	2
	27.536	Latin American Art	2
	27.537	Buddhist Art	2
	27.538	Chinese Art	2
	27.539	Japanese Art	2
	27.547	European Graphic Arts	2
27.587, 27.588,	27.589	History of Photography I, II, III	2
	27.592	New York Art Seminar	2
27.597, 27.598,	27.599	History and Technique of Film I, II, III	2

**Area II—Studio Art Major****Required:**

27.541, 27.542,	27.543	Drawing I, II, III	9
27.561, 27.562,	27.563	Basic Color and Design I, II, III	9

Eighteen hours must be taken from the following courses:

27.544, 27.545,	27.546	Graphic Arts I, II, III	9
27.551, 27.552,	27.553	Painting—Basic Level I, II, III	9
27.554, 27.555,	27.556	Painting—Advanced Level I, II, III	9
	27.564	Advanced Color and Design	3
27.571, 27.572,	27.573	Business Commercial Design I, II, III	9
	27.574	Advanced Commercial Design	3
27.577, 27.578,	27.579	Stained Glass Design I, II, III	9
			<b>44</b>

Elective Courses      Sufficient to fulfill Total Credit Requirements

**Total Credits****174**

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**HISTORY****Bachelor of Science Degree****Basic Courses—required**

quarter hours

10.501, 10.502, 10.503	Mathematics I, II, III	6	
19.501, 19.502, 19.503	Psychology I, II, III	6	
23.501, 23.502, 23.503	Western Civilization I, II, III	6	
30.504, 30.505, 30.506	English I, II, III	6	
30.601, 30.602	Composition and Rhetoric I, II	4	
30.604, 30.605	Introduction to Literary Forms I, II	4	32
		—	

**Core Courses—required**

16.501, 16.502, 16.503	Earth Science I, II, III	6	
21.501, 21.502, 21.503	Sociology I, II, III	6	
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6	
23.504, 23.505, 23.506	U. S. History I, II, III	6	
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:	Art, Music, or Theatre Arts	6	
Literature:	English, American, or other in translation	6	
Modern Language:*	Elementary	9	
	Intermediate	9	
Science or Mathematics		6	66
		—	

**Major Concentration Courses—required**

Each student will select a minimum of 40 hours from the following areas, with the provision that at least four courses must be completed from each area. The remaining eight hours may be taken in any area. Students in the Honors Program may take these eight hours in 23.597 and 23.598. The four credits for 23.599 should be substituted for two electives.

**Area I**

23.521	Ancient Middle East	2
23.522	Ancient Greece	2
23.523	Ancient Rome	2
23.524	Early Middle Ages	2
23.525	Late Middle Ages	2
23.526	Early Modern Europe	2
23.527	England, 500–1603	2
23.537	European Intellectual History 1350–1688	2

(continued on following page)

\*One full year of a modern language beyond the elementary level is a requirement for graduation.



**Area II**

23.538	European Intellectual History 1688–1815	2
23.539	European Intellectual History Since 1815	2
23.541	Europe, 1688–1789	2
23.542	Europe, 1789–1870	2
23.543	Europe, 1870–1914	2
23.544	Europe, 1914–1939	2
23.545	Europe since 1939	2
23.548	England, 1603–1815	2
23.549	England since 1815	2
23.552	English Constitutional History to 1485	2
23.553	English Constitutional History since 1485	2
23.554	France since 1815	2
23.555	Germany since 1815	2
23.556	Italy since 1815	2
23.557	Ireland since 1800	2

**Area III**

23.561	Colonial America to 1689	2
23.562	Colonial America, 1689–1763	2
23.563	American Revolution and Constitution	2
23.564	Topics in American Constitutional History to 1900	2
23.565	Topics in 20th-Century American Constitutional History	2
23.566	United States since 1933	2
23.567	Topics in American Diplomatic History	2
23.568	Topics in American Social History	2
23.569	Topics in American Economic History	2
23.571	American Urban History	2
23.574	Afro-American History	2

(continued on following page)

## Area IV

23.581	Latin America to 1826	2	
23.582	Latin America, 1826–1920	2	
23.583	Contemporary Latin America	2	
23.584	The Far East before 1850	2	
23.585	China since 1850	2	
23.586	Japan since 1850	2	
23.588	Africa North of Sahara	2	
23.589	Africa South of Sahara	2	
23.591	Modern Middle East	2	
23.592	India and Pakistan	2	
23.593	Southeast Asia	2	
23.594	Russia, 1450–1801	2	
23.595	Russia, 1801–1917	2	
23.596	Russia since 1917	2	40

## Elective Courses\*

— 36

## Total Credits

---

174

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

## LIBERAL ARTS

## Associate in Science Degree

			quarter hours	
Math—Science*			16	
Humanities*			24	
Social Sciences*			24	
	30.601, 30.602	Composition and Rhetoric I, II	4	
	30.604, 30.605	Introduction to Literary Forms	4	
Electives			24	
			—	
	Total Credits			96

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\*See page 74 for courses included in the various designations.

**POLITICAL SCIENCE****Bachelor of Science Degree****Basic Courses—required**

quarter hours

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required**

16.501,	16.502,	16.503	Earth Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	

(continued on following page)

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Major Concentration Courses—required**

22.504	Introduction to Political Theory	2
22.505	Contemporary Political Theory	2
22.506	American Political Thought	2

Each student will select a minimum of 34 hours from the following areas:

**Area I**

22.511	American National Government	2
22.512	Urban and Metropolitan Government	2
22.513	Political Parties and Pressure Groups	2
22.514	American Constitutional Law	2
22.515	Civil Rights	2
22.516	Public Administration I	2
22.517	Public Administration II	2
22.518	Government and Politics of the States	2
22.519	The Legislative Process	2

**Area II**

22.521	Comparative Government I	2
22.522	Comparative Government II	2
22.523	Government and Politics of Latin America	2
22.524	Government and Politics of the Middle East	2
22.525	Government and Politics of the Far East	2
22.526	Government and Politics of Africa	2
22.527	Communism in Eastern Europe	2

**Area III**

22.531	International Relations	2
22.532	International Organization	2
22.534	Soviet Foreign Policy	2
22.541	International Law	2
22.542	American Foreign Policy I	2
22.543	American Foreign Policy II	2
		40

Elective Courses\*

36

**Total Credits**

**174**

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**PSYCHOLOGY****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III**	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required**

16.501,	16.502,	16.503	Earth Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66
				—	

(continued on following page)

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

\*\*It is recommended that Psychology majors substitute 19.508 and 19.509—Fundamentals of Psychology I and II for 19.501, 502, and 503.

**Major Concentration Courses—required**

19.504,	19.505,	19.506	Statistics in Psychology I, II, III	6
19.551,	19.552,	19.553	Experimental Psychology I, II, III	9
19.561,	19.562,	19.563	Historical Development of Psychology I, II, III	6

In addition to the courses listed above, required of all Psychology majors, each student will select a minimum of 22 hours from the following courses:

19.511,	19.512	Child Psychology I, II	4	
	19.513	Adolescent Psychology	2	
19.521,	19.522	Personality I, II	4	
	19.523	Motivation	2	
19.524,	19.525	Social Psychology I, II	4	
	19.526	Psychology of Aggression	2	
	19.527	Psychology of Conformity and Rebellion	2	
	19.528	Psychological Factors in National and International Conflict	2	
	19.529	Interpersonal Behavior in the Small Group I	2	
	19.530	Interpersonal Behavior in the Small Group II	2	
	19.535	Psychological Factors in the Creative Process	2	
	19.536	Psychology of Thought	2	
	19.537	Psychology of Language	2	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6
		19.546	Psychological Testing I	2
		19.547	Psychological Testing II	2
		19.571	Seminar in Psychology	2 43
19.591,	19.592,	19.593	Honors Program I, II, III	6 only

**Elective Courses\*****33****Total Credits****174**

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**SOCIOLOGY-ANTHROPOLOGY****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32

**Core Courses—required**

16.501,	16.502,	16.503	Earth Science I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23.505,	23.506	U. S. History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Fine Arts:			Art, Music, or Theatre Arts	6	
Literature:			English, American, or other in translation	6	
Modern Language:*			Elementary	9	
			Intermediate	9	
Science or Mathematics				6	66

**Major Concentration Courses—required**

		20.501	Introduction to Physical Anthropology	2	
	20.502,	20.503	Cultural Anthropology I, II	4	
21.512,	21.513,	21.514	Social Research Methods I, II, III	6	
		21.517	Foundations of Sociological Theory	2	
		21.518	Contemporary Sociological Theory I	2	
		21.519	Contemporary Sociological Theory II	2	18

Four hours must be taken from the following courses:

21.528	Social Stratification	2	
21.531	Social Change	2	
21.534	Social Control	2	
21.535	Political Sociology	2	4

In addition to the courses listed above, required of all Sociology majors, each student will select a minimum of 22 hours from either Area I or Area II. (See following page.)

\*One full year of a modern language beyond the elementary level is a requirement for graduation.



**Area I—Sociological-Social Work Major****Required:**

21.538,	21.539,	21.540	Introduction to Social Welfare I, II, III	6	
21.543,	21.544,	21.545	Introduction to Social Work Practice I, II, III	6	
				<hr/>	12

Ten hours must be taken from the following courses:

		21.546	Sociology of Deviant Behavior	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.551,	21.552	Family and Marriage I, II	4	
21.553,	21.554,	21.555	Racial and Cultural Relations I, II, III	6	
		21.557	Urban Sociology	2	10
		21.558	Community Analysis	2	
		21.560	Medical Sociology	2	
		21.563	Social Gerontology	2	
		21.567	Population	2	
		21.570	Sociology of Occupations and Professions	2	
		21.573	Sociology of Industry	2	
		21.575	Sociology of Formal Organizations	2	
21.591,	21.592,	21.593	Honors Program I, II, III	12	
				<hr/>	32

**Elective Courses\***

<b>Total Credits</b>	<hr/>	<b>174</b>
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\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**Area II—Sociology-Anthropology Major****Required:**

20.531	Primitive Social Organization	2
21.567	Population	2

Twelve hours must be taken from the following courses:

	21.546	Sociology of Deviant Behavior	2
	21.547	Social Problems	2
21.548,	21.549	Criminology I, II	4
	21.550	Juvenile Delinquency	2
21.551,	21.552	Family and Marriage I, II	4
21.553, 21.554,	21.555	Racial and Cultural Relations I, II, III	6
	21.557	Urban Sociology	2
	21.558	Community Analysis	2
	21.560	Medical Sociology	2
	21.563	Social Gerontology	2
	21.570	Sociology of Occupations and Professions	2
	21.573	Sociology of Industry	2
	21.575	Sociology of Formal Organizations	2
21.591, 21.592,	21.593	Honors Program I, II, III	12

Six hours must be taken from the following courses:

20.521	Culture and Personality	2
20.532	Primitive Religion	2
20.533	Acculturation	2
20.537	Anthropological Theory	2
20.541	North American Indian	2
20.544	African Peoples and Culture	2
20.547	Latin American Peoples and Culture	2
		<b>22</b>

**Elective Courses\*****32****Total Credits****174**

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**MUSIC****Bachelor of Science Degree**

<b>Basic Courses—required</b>			<b>quarter hours</b>	
10.501, 10.502, 10.503	Mathematics I, II, III		6	
19.501, 19.502, 19.503	Psychology I, II, III		6	
23.501, 23.502, 23.503	Western Civilization I, II, III		6	
30.601, 30.602	Composition and Rhetoric I, II		4	
30.604, 30.605	Introduction to Literary Forms I, II		4	
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III		6	32
<b>Core Courses—required</b>			—	
16.501, 16.502, 16.503	Earth Science I, II, III		6	
21.501, 21.502, 21.503	Sociology I, II, III		6	
22.501, 22.502, 22.503	Principles of Political Science I, II, III		6	
23.504, 23.505, 23.506	U.S. History I, II, III		6	
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III		6	
Fine Arts:	Art, Music, or Theatre Arts		6	
Literature:	English, American, or other in Trans.		6	
Modern Language	Elementary		9	
	Intermediate		9	
Science or Mathematics			6	66
<b>Major Concentration Courses—required</b>			—	
	Theory I, II, III		6	
	Theory IV, V, VI		6	
	Contrapuntal Techniques I, II		4	
	Piano Class I		2	
	History of Music I, II, III		6	24
			—	

**Major Concentration Courses—elective**

28.512	Music before 1750	2	
28.513	Music of Classical Era	2	
28.514	Aspects of Romantic Music	2	
28.515	Contemporary Music	2	
28.520	Musical Forms	2	
28.521	The Symphony	2	
28.522	The Concerto	2	
28.523	The Great Literature for Piano	2	
28.524	The World of Opera	2	
28.531	Life and Works of J. S. Bach	2	
28.532	Life and Works of Mozart	2	
28.533	Life and Works of Beethoven	2	
28.572	Piano Class II	2	
28.573	Piano Class III	2	
28.574	Orchestral Instrumental Class I	2	
28.575	Orchestral Instrumental Class II	2	
28.576	Orchestral Instrumental Class III	2	
28.577	Voice Culture I	2	
28.578	Voice Culture II	2	
28.579	Voice Culture III	2	
28.595	Opera Seminar	2	
28.526	Jazz: Evolution and Essence	2	
28.597	Symphony Seminar	2	20
		—	

**Free Electives****32****Total Credits****174**

# law enforcement

## **Aims**

Law Enforcement programs of study are offered to meet the needs of present and potential practitioners in the fields of Corrections, Law Enforcement, and Security who wish to acquire a liberal education as well as a professional competence, or to gain recognition for development and attainment while pursuing a career in that profession.

## **Methods**

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific career objectives.

To provide a balanced program which will achieve the established objectives, the faculty has set minimum requirements in the areas of study outlined on the following pages, with a recommended sequence of courses for each program.

## **Bachelor of Science Degree**

Major fields of study are offered in Correctional Practices, Law Enforcement, and Security. Students should choose their major field of study and their electives in consultation with a program adviser.

Each curriculum provides for not less than 174 quarter hours of work, including at least 60 quarter hours of advanced work in a major field.

No student transferring from another college or university is eligible to receive a degree until at least 46 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

## **Associate in Science Program**

The program leading to the associate degree is offered for those who wish to obtain a general background in Correctional Practices, Law Enforcement, or Security but do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree, and includes at least 40 quarter hours of work in a major field.

**CORRECTIONAL PRACTICES****Bachelor of Science Degree****quarter hours****Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	*30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required**

	19.524,	19.525	Social Psychology I, II	4	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.553,	21.554	Racial and Cultural Relations I, II	4	
		21.557	Urban Sociology	2	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
23.504,	23.505,	23.506	U.S. History I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	56
				—	

(continued on following page)

\*For new English requirements see explanation on page 176.

**Major Concentration Courses—required**

	94.501	Administration of Justice	2	
	94.502	Criminal Law	2	
94.503,	94.504	Evidence and Court Procedure I, II	4	
	94.505	Human Rights in Corrections	2	
	94.506	Basic Statistics in Corrections	2	
	94.507	Correctional Counseling	2	
94.517, 94.518,	94.519	Advanced Correctional Practices I, II, III	6	
	94.523	The Law and Institutional Treatment	2	
	94.524	Comparative Correctional Systems	2	
94.525, 94.526,	94.527	Law Enforcement Identification and Records I, II, III	6	
	94.532	Research Methods in Criminal Justice	2	
	94.544	The American Correctional System	2	
	94.546, 94.547	Social Deviance I, II	4	
	94.549, 94.550	Treatment of Offenders I, II	4	
94.551, 94.552,	94.553	Correctional Administration I, II, III	6	
	94.567, 94.568	Probation and Parole Practices I, II	4	
	94.574, 94.575	Juvenile Corrections I, II	4	
	94.593	Seminar in Correctional Practices	2	58
			—	
<b>Elective Courses*</b>				<b>28</b>
<b>Total Credits</b>				<b>174</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

**CORRECTIONAL PRACTICES****Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

All new students should discuss their program with a program adviser before attempting to undertake the following sequence of courses:

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st</b>	23.501	23.502	23.503
<b>Year</b>	Western Civ. I	West. Civ. II	Western Civ. III
	*30.601	30.602	
	Comp. & Rhet. I	Comp. & Rhet. II	Elective
	94.501	94.546	94.547
	Admin. of Justice	Social Deviance I	Social Deviance II
	94.502	94.503	94.504
	Criminal Law	Evid. & Ct. Proc. I	Evid. & Ct. Proc. II
<b>2nd</b>	21.501	21.502	21.503
<b>Year</b>	Sociology I	Sociology II	Sociology III
	30.604	30.605	
	Intro. to Lit.	Intro. to Lit.	Elective
	Forms I	Forms II	
	94.544	94.505	94.523
	Amer. Corr. System	Human Rts. in Corr.	Law and Inst. Treat.
	94.574	94.575	94.507
	Juvenile Corr. I	Juvenile Corr. II	Corr. Counseling
<b>3rd</b>	19.501	19.502	19.503
<b>Year</b>	Psychology I	Psychology II	Psychology III
	21.553	21.554	21.557
	Rac. & Cul. Rel. I	Rac. & Cul. Rel. II	Urban Sociology
	94.506	94.549	94.550
	Basic Stats. in Corr.	Treat. Offenders I	Treat. Offenders II
	94.551	94.552	94.553
	Corr. Admin. I	Corr. Admin. II	Corr. Admin. III
<b>4th</b>	21.548	21.549	21.550
<b>Year</b>	Criminology I	Criminology II	Juvenile Delinq.
	22.514	22.515	94.532
	Amer. Const. Law	Civil Rights	Res. Meth. Crim. Just.
	94.567	94.568	Elective
	Prob. & Par. Prac. I	Prob. & Par. Prac. II	
	Elective	Elective	Elective

(continued on following page)

\*For new English requirements see explanation on page 176.



5th Year	10.501 Mathematics I	10.502 Mathematics II	10.503 Mathematics III
	19.541 Abnorm. Psych. I	19.542 Abnorm. Psych. II	19.543 Abnorm. Psych. III
	22.501 Prin. Polit. Sc. I	22.502 Prin. Polit. Sc. II	22.503 Prin. Polit. Sc. III
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	94.527 Law Enf. Id. & Rec. III
6th Year	23.504 History I	23.505 History II	23.506 History III
	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	94.517 Adv. Corr. Prac. I	94.518 Adv. Corr. Prac. II	94.519 Adv. Corr. Prac. III
7th Year	19.524 Soc. Psych. I	19.525 Soc. Psych. II	19.534 Social Control
	45.511 Hum. Rel. in Pers. I	45.512 Hum. Rel. in Pers. II	Elective
	Elective	Elective	Elective
8th Year	22.516 Public Admin. I	22.517 Public Admin. II	22.547 Social Problems
	94.593 Sem. Corr. Pract.	94.524 Comp. Corr. Systems	Elective
	Elective	Elective	Elective

**CORRECTIONAL PRACTICES****Associate in Science Degree****quarter hours****Basic Courses—required**

19.501,	19.502,	19.503	Psychology I, II, III	6	
	**30.601,	30.602	Composition and Rhetoric I, II	4	10
				—	

**Core Courses—required**

19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
	21.553,	21.554	Racial and Cultural Relations I, II	4	
		21.557	Urban Sociology	2	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	28
				—	

**Major Concentration Courses—required**

		94.501	Administration of Justice	2	
		94.502	Criminal Law	2	
	94.503,	94.504	Evidence and Court Procedure I, II	4	
		94.505	Human Rights in Corrections	2	
		94.506	Basic Statistics in Corrections	2	
		94.507	Correctional Counseling	2	
		94.523	The Law and Institutional Treatment	2	
		94.532	Research Methods in Criminal Justice	2	
		94.544	The American Correctional System	2	
	94.546,	94.547	Social Deviance I, II	4	
	94.549,	94.550	Treatment of Offenders I, II	4	
94.551,	94.552,	94.553	Correctional Administration I, II, III	6	
	94.567,	94.568	Probation and Parole Practices I, II	6	
	94.574,	94.575	Juvenile Corrections I, II	4	44
				—	

**Elective Courses\*****14****Total Credits****96**

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

\*\*For new English requirements see explanation on page 176.

## CORRECTIONAL PRACTICES

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

All new students should discuss their programs with advisers before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
<b>1st Year</b>	30.601 Comp. & Rhet. I 94.501 Admin. of Justice 94.502 Criminal Law 94.544 Amer. Corr. Syst.	30.602 Comp. & Rhet. II 94.546 Social Deviance I 94.503 Evid. & Ct. Proc. I 94.505 Human Rts. in Corr.	Elective 94.547 Social Deviance II 94.504 Evid. & Ct. Proc. II 94.523 Law and Inst. Treat.
<b>2nd Year</b>	21.501 Sociology I 94.506 Basic Stats. in Corr. 94.551 Corr. Admin. I 94.574 Juvenile Corr. I	21.502 Sociology II 94.549 Treat. Offenders I 94.552 Corr. Admin. II 94.575 Juvenile Corr. II	21.503 Sociology III 94.550 Treat. Offenders II 94.553 Corr. Admin. III 94.507 Corr. Counseling
<b>3rd Year</b>	19.501 Psychology I 21.553 Rac. & Cul. Rel. I 94.567 Prob. & Par. Prac. I Elective	19.502 Psychology II 21.554 Rac. & Cul. Rel. II 94.568 Prob. & Par. Prac. II Elective	19.503 Psychology III 21.557 Urban Sociology Elective Elective
<b>4th Year</b>	19.541 Abnorm. Psych. I 21.548 Criminology I 22.514 Amer. Const. Law Elective	19.542 Abnorm. Psych. II 21.549 Criminology II 22.515 Civil Rights Elective	19.543 Abnorm. Psych. III 21.550 Juvenile Delinq. 94.532 Res. Meth. Crim. Just. Elective

**LAW ENFORCEMENT****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	*30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required**

	19.524,	19.525	Social Psychology I, II	4	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
23.504,	23.505,	23.506	U.S. History I, II, III	6	46
				—	

(continued on following page)

\*For new English requirements see explanation on page 176.

**Major Concentration Courses—required**

	94.501	Administration of Justice	2	
	94.502	Criminal Law	2	
	94.503, 94.504	Evidence and Court Procedure I, II	4	
94.508, 94.509, 94.510		Criminal Investigation and Case Preparation I, II, III	6	
	94.511	Civil Law in Criminal Justice	2	
	94.512	Comparative Police Systems	2	
	94.514, 94.515	Interviews and Interrogations I, II	4	
94.520, 94.521, 94.522		Traffic Law Enforcement I, II, III	6	
94.525, 94.526, 94.527		Law Enforcement Identification and Records I, II, III	6	
	94.530	Police Public Relations	2	
	94.531	Police Community Relations	2	
	94.532	Research Methods in Criminal Justice	2	
	94.536, 94.537	The Patrol Function I, II	4	
	94.541, 94.542	Introduction to Criminalistics I, II	4	
	94.546, 94.547	Social Deviance I, II	4	
	94.557	Investigative Report Writing	2	
	94.560	Police Supervision	2	
	94.561	Police Work with Juveniles	2	
	94.565	Seminar in Delinquency Prevention	2	
94.571, 94.572, 94.573		Law Enforcement Management and Planning I, II, III	6	
	**94.590	Seminar in Law Enforcement	2	68
			—	
<b>Elective Courses*</b>				<b>28</b>
<b>Total Credits</b>				<b>174</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

\*\*Course 94.590—Seminar in Law Enforcement (2 q.h.) is now identified by courses 94.601 through 94.626.

## LAW ENFORCEMENT

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

All new students should discuss their program with advisers before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	23.501 Western Civ. I 30.601 Comp. & Rhet. I 94.501 Admin. of Justice 94.502 Criminal Law	23.502 Western Civ. II 30.602 Comp. & Rhet. II 94.546 Social Deviance I 94.503 Evid. & Ct. Proc. I	23.503 Western Civ. III  Elective 94.547 Social Deviance II 94.504 Evid. & Ct. Proc. II
2nd Year	21.501 Sociology I 30.604 Intro. to Lit. Forms I 94.514 Interv. & Interr. I 94.536 Patrol Funct. I	21.502 Sociology II 30.605 Intro. to Lit. Forms II 94.515 Interv. & Interr. II 94.537 Patrol Funct. II	21.503 Sociology III  Elective 94.557 Inv. Report Writing 94.560 Police Supervision
3rd Year	19.501 Psychology I 94.520 Traf. Law Enf. I 94.508 Cr. Inv. Case Prep. I  94.541 Int. Criminalist. I	19.502 Psychology II 94.521 Traf. Law Enf. II 94.509 Cr. Inv. Case Prep II  94.542 Int. Criminalist. II	19.503 Psychology III 94.522 Traf. Law Enf. III 94.510 Cr. Inv. Case Prep. III 94.561 Pol. Work with Juv.
4th Year	21.548 Criminology I 22.514 Amer. Const. Law 94.530 Police Public Rel.  Elective	21.549 Criminology II 22.515 Civil Rights 94.531 Police Comm. Rel.  Elective	21.550 Juvenile Delinq. 94.511 Civ. Law Crim. Just. 94.532 Res. Meth. Crim. Just. Elective

(continued on following page)

5th Year	10.501 Mathematics I	10.502 Mathematics II	10.503 Mathematics III
	19.541 Abnorm. Psych. I	19.542 Abnorm. Psych. II	19.543 Abnormal Psych. III
	22.501 Prin. Polit. Sc. I	22.502 Prin. Polit. Sc. II	22.503 Prin. Polit. Sc. III
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	94.527 Law Enf. Id. & Rec. III
6th Year	23.504 History I	23.505 History II	23.506 History III
	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	94.571 Law Enf. Mgt. & Pl. I	94.572 Law Enf. Mgt. & Pl. II	94.573 Law Enf. Mgt. & Pl. III
7th Year	19.524 Soc. Psych. I	19.525 Soc. Psych. II	21.534 Social Control
	94.565 Sem. Delinq. Prev.	94.512 Comp. Pol. Systems	Elective
	Elective	Elective	Elective
8th Year	22.516 Public Admin. I	22.517 Public Admin. II	22.547 Social Problems
	*94.590 Sem. in Law Enf.	Elective	Elective
	Elective	Elective	Elective

\*Course 94.590—Seminar in Law Enforcement (2 q.h.) is now identified by courses 94.601 through 94.626.

**LAW ENFORCEMENT****Associate in Science Degree**  
**quarter hours****Basic Courses—required**

19.501, 19.502, 19.503	Psychology I, II, III	6	
**30.601, 30.602	Composition and Rhetoric I, II	4	10
		—	

**Core Courses—required**

19.541, 19.542, 19.543	Abnormal Psychology I, II, III	6	
21.501, 21.502, 21.503	Sociology I, II, III	6	
21.548, 21.549	Criminology I, II	4	
21.550	Juvenile Delinquency	2	
22.514	American Constitutional Law	2	
22.515	Civil Rights	2	22
		—	

**Major Concentration Courses—required**

	94.501	Administration of Justice	2	
	94.502	Criminal Law	2	
	94.503, 94.504	Evidence and Court Procedure I, II	4	
94.508, 94.509, 94.510		Criminal Investigation and Case Preparation I, II, III	6	
	94.511	Civil Law in Criminal Justice	2	
	94.514, 94.515	Interviews and Interrogations I, II	4	
94.520, 94.521, 94.522		Traffic Law Enforcement I, II, III	6	
	94.530	Police Public Relations	2	
	94.531	Police Community Relations	2	
	94.532	Research Methods in Criminal Justice	2	
	94.536, 94.537	The Patrol Function I, II	4	
	94.541, 94.542	Introduction to Criminalistics I, II	4	
	94.546, 94.547	Social Deviance I, II	4	
	94.557	Investigative Report Writing	2	
	94.560	Police Supervision	2	
	94.561	Police Work with Juveniles	2	50
			—	

**Elective Courses\*****14****Total Credits****96**

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

\*\*For new English requirements see explanation on page 176.



## LAW ENFORCEMENT

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

All new students should discuss their program with their program advisers  
before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I 94.501 Admin. of Justice 94.502 Criminal Law 94.514 Interv. & Interr. I	30.602 Comp. & Rhet. II 94.546 Social Deviance I 94.503 Evid. & Ct. Proc. I 94.515 Interv. & Interr. II	Elective 94.547 Social Deviance II 94.504 Evid. & Ct. Proc. II 94.557 Inv. Report Writing
2nd Year	21.501 Sociology I 94.520 Traf. Law Enf. I 94.508 Cr. Inv. Case Prep. I 94.536 Patrol Funct. I	21.502 Sociology II 94.521 Traf. Law Enf. II 94.509 Cr. Inv. Case Prep. II 94.537 Patrol Funct. II	21.503 Sociology III 94.522 Traf. Law Enf. III 94.510 Cr. Inv. Case Prep. III 94.560 Police Supervision
3rd Year	19.501 Psychology I 94.530 Police Public Rel.  94.541 Int. Criminalist. I Elective	19.502 Psychology II 94.531 Police Comm. Rel.  94.542 Int. Criminalist. II Elective	19.503 Psychology III 94.532 Res. Meth. Crim. Just. 94.561 Pol. Work With Juv. Elective
4th Year	19.541 Abnorm. Psych. I 21.548 Criminology I 22.514 Amer. Const. Law Elective	19.542 Abnorm. Psych. II 21.549 Criminology II 22.515 Civil Rights Elective	19.543 Abnorm. Psych. III 21.550 Juvenile Delinq. 94.511 Civ. Law Crim. Just. Elective

**SECURITY****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	*30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required**

19.532,	19.533,	19.534	Industrial Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
	21.548,	21.549	Criminology I, II	4	
		21.550	Juvenile Delinquency	2	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
		45.510	Labor Relations Management	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
		45.620	Industrial Safety	2	50

(continued on following page)

\*For new English requirements see explanation on page 176.

**Major Concentration Courses—required**

	94.501	Administration of Justice	2	
	94.502	Criminal Law	2	
	94.503, 94.504	Evidence and Court Procedure I, II	4	
94.508, 94.509, 94.510		Criminal Investigation and Case Preparation I, II, III	6	
	94.511	Civil Law in Criminal Justice	2	
	94.513	Introduction to Industrial Security	2	
	94.514, 94.515	Interviews and Interrogations I, II	4	
	94.516	Security Administration	2	
94.525, 94.526, 94.527		Law Enforcement Identification and Records I, II, III	6	
	94.536, 94.537	The Patrol Function I, II	4	
	94.541, 94.542	Introduction to Criminalistics I, II	4	
	94.557	Investigative Report Writing	2	
94.571, 94.572, 94.573		Law Enforcement Management and Planning I, II, III	6	
94.577, 94.578, 94.579		Government Security Programs I, II, III	6	
	94.582	Document Control	2	
	94.583	Industrial Fire Prevention	2	
	94.584, 94.585	Physical Security I, II	4	
	94.586	Retail Security	2	
	94.587	Bank Security Measures	2	
	94.591	Seminar in Security	2	66
<b>Elective Courses*</b>				<u>26</u>
<b>Total Credits</b>				<b>174</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

All new students should discuss their program with their program advisers before undertaking the following sequence of courses:

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	23.501 Western Civ. I 30.601 Comp. & Rhet. I 94.501 Admin. of Justice 94.502 Criminal Law	23.502 Western Civ. II 30.602 Comp. & Rhet. II 94.513 Int. Indust. Sec. 94.503 Evid. & Ct. Proc. I	23.503 Western Civ. III  Elective 94.586 Retail Security 94.504 Evid. & Ct. Proc. II
<b>2nd Year</b>	21.501 Sociology I 30.604 Intro. to Lit. Forms I 94.514 Interv & Interr. I 94.536 Patrol Funct. I	21.502 Sociology II 30.605 Intro. to Lit. Forms II 94.515 Interv. & Interr. II 94.537 Patrol Funct. II	21.503 Sociology III  Elective 94.557 Interv. & Interr. III 94.583 Indust. Fire Prev.
<b>3rd Year</b>	19.501 Psychology I 45.570 Elect. Data Proc. I 94.508 Cr. Inv. Case Prep. I 94.584 Phys. Security I	19.502 Psychology II 45.571 Elect. Data Proc. II 94.509 Cr. Inv. Case Prep. II 94.585 Phys. Security II	19.503 Psychology III 45.572 Elect. Data Proc. III 94.510 Cr. Inv. Case Prep. III 94.516 Security Admin.
<b>4th Year</b>	21.548 Criminology I 22.514 Amer. Const. Law 94.577 Gov. Sec. Prog. I Elective	21.549 Criminology II 22.515 Civil Rights 94.578 Gov. Sec. Prog. II Elective	21.550 Juvenile Delinq. 94.511 Civ. Law Crim. Just. 94.579 Gov. Sec. Prog. III Elective

(continued on following page)

5th Year	10.501 Mathematics I	10.502 Mathematics II	10.503 Mathematics III
	19.532 Int. Indust. Psy. I	19.533 Int. Indust. Psy. II	19.534 Int. Indust. Psy. III
	41.501 Acctg. Prin. I	41.502 Acctg. Princ. II	41.503 Acctg. Princ. III
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	94.527 Law Enf. Id. & Rec. III
6th Year	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	44.501 Capt. Inst. & Risk I	44.502 Capt. Inst. & Risk II	44.503 Capt. Inst. & Risk III
	94.571 Law Enf. Mgt. & Plan. I	94.572 Law Enf. Mgt. & Plan. II	94.573 Law Enf. Mgt. & Plan. III
7th Year	45.620 Indust. Safety I	94.587 Bank Sec. Meas.	45.510 Labor Mgt. Rel.
	94.541 Int. Criminalist. I Elective	94.542 Int. Criminalist. II Elective	94.582 Document Control Elective
8th Year	44.514 Prop. & Cas. Ins. I	44.515 Prop. & Cas. Ins. II	44.516 Prop. & Cas. Ins. III
	94.591 Sem. in Security Elective	Elective	Elective

**SECURITY****Associate in Science Degree**

quarter hours

**Basic Courses—required**

19.501, 19.502, 19.503	Psychology I, II, III	6	
**30.601, 30.602	Composition and Rhetoric I, II	<u>4</u>	10

**Core Courses—required**

19.532, 19.533, 19.534	Industrial Psychology I, II, III	6	
21.501, 21.502, 21.503	Sociology I, II, III	6	
21.548, 21.549	Criminology I, II	4	
21.550	Juvenile Delinquency	2	
22.514	American Constitutional Law	2	
22.515	Civil Rights	2	
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	<u>6</u>	28

**Major Concentration Courses—required**

	94.501	Administration of Justice	2	
	94.502	Criminal Law	2	
	94.503, 94.504	Evidence and Court Procedure I, II	4	
94.508, 94.509, 94.510		Criminal Investigation and Case Preparation I, II, III	6	
	94.511	Civil Law in Criminal Justice	2	
	94.513	Introduction to Industrial Security	2	
	94.514, 94.515	Interviews and Interrogations I, II	4	
	94.516	Security Administration	2	
	94.536, 94.537	The Patrol Function I, II	4	
	94.557	Investigative Report Writing	2	
94.577, 94.578, 94.579		Government Security Programs I, II, III	6	
	94.583	Industrial Fire Prevention	2	
	94.584, 94.585	Physical Security I, II	4	
	94.586	Retail Security	<u>2</u>	44

**Elective Courses\***14**Total Credits**96

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

\*\*For new English requirements see explanation on page 176.

## SECURITY

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

All new students should discuss their programs with advisers before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
<b>1st Year</b>	30.601 Comp. & Rhet. I 94.501 Admin. of Justice 94.502 Criminal Law 94.514 Interv. & Interr. I	30.602 Comp. & Rhet. II 94.513 Int. Indust. Sec. 94.503 Evid. & Ct. Proc. I 94.515 Interv. & Interr. II	Elective 94.586 Retail Security 94.504 Evid. & Ct. Proc. II 94.557 Inv. Report Writing
<b>2nd Year</b>	21.501 Sociology I 94.536 Patrol Funct. I 94.584 Phys. Security I 94.508 Cr. Inv. & Case Prep. I	21.502 Sociology II 94.537 Patrol Funct. II 94.585 Phys. Security II 94.509 Cr. Inv. Case Prep II.	21.503 Sociology III 94.583 Indust. Fire Prev. 94.516 Security Admin. 94.510 Cr. Inv. Case Prep. III
<b>3rd Year</b>	19.501 Psychology I 45.570 Elect. Data Proc. I 94.577 Gov. Sec. Prog. I Elective	19.502 Psychology II 45.571 Elect. Data. Proc. II 94.578 Gov. Sec. Prog. II Elective	19.503 Psychology III 45.572 Elect. Data Proc. III 94.579 Gov. Sec. Prog. III Elective
<b>4th Year</b>	19.532 Int. Indust. Psy. I 21.548 Criminology I 22.514 Amer. Const. Law Elective	19.533 Int. Indust. Psy. II 21.549 Criminology II 22.515 Civil Rights Elective	19.534 Int. Indust. Psy. III 21.550 Juvenile Delinq. 94.511 Civ. Law Crim. Just. Elective

# health-related programs

- *forsyth school/northeastern university program for dental hygienists*
- *health science programs*
- *lincoln college/university college affiliated programs*

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## FORSYTH/NORTHEASTERN UNIVERSITY PROGRAM FOR DENTAL HYGIENISTS

### Bachelor of Science Degree

The Forsyth School for Dental Hygienists conducts a two-year day program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the Associate in Science degree from University College. After receiving their Associate in Science degree, students may complete the remaining Liberal Arts courses required for the Bachelor of Science degree given by University College.

				quarter hours
<b>Associate in Science Degree</b>				<b>94</b>
(Day program at Northeastern University and Forsyth School for Dental Hygienists)				
<b>Liberal Arts Courses</b>				
(Required through University College)				
10.501, 10.502, 10.503	Mathematics I, II, III			6
22.501, 22.502, 22.503	Principles of Political Science I, II, III			6
23.501, 23.502, 23.503	Western Civilization I, II, III			6
23.504, 23.505, 23.506	U. S. History I, II, III			6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III			6
30.604, 30.605	Introduction to Literary Forms I, II			4
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III			6
Fine Arts:	Art, Music, or Theatre Arts			6
Literature:	English, American, or other in translation			6
				52
<b>Elective Courses*</b>				<b>28</b>
				<hr/>
	<b>Total Credits</b>			<b>174</b>

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\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.



## HEALTH SCIENCE PROGRAMS

### Aims

Programs in Health Sciences are offered through University College in order to help mature students improve their educational preparation for advancement and service in hospitals and other health agencies through part-time study.

In addition to offering courses in the liberal arts and in business administration, specialized courses for particular categories of health personnel are offered when such offerings are justified in terms of community and student need. The unique resources of the Boston area as a medical center offer excellent support facilities for these health-related programs.

In addition to technically oriented courses for health specialists, a core of courses is offered which is designed to provide all health workers with a foundation for improved interdisciplinary cooperation and communication.

## MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Bachelor of Science Degree

quarter hours

## Basic Courses—required

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32

## Core Courses—required

## Liberal Arts

18.304,	18.305,	18.306	Integrated Science I, II, III	12*	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:			English, American or other in translation	6	
Fine Arts:			Art, Music or Theatre Arts	6	44

## Management

41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	34

## Health Care Administration

		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
		86.507	Medical Terminology	2	

In addition, each student will select one of the following sequences:

86.581,	86.582,	86.583	Hospital Organization and Management I, II, III—OR	}	6
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III—OR		
	86.521,	86.522	Public Health I, II		
		86.511	Personal and Community Health		
				2	16

\*Science courses with equivalent subject content may be substituted for Integrated Science with approval of the program director.

**Elective Courses:**

Liberal Arts	6	
Management	6	
From Any Area	36	48
	<hr/>	<hr/>
<b>Total Credits</b>		<b>174</b>

**Note:** In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study; or b) completion of the program on descriptive statistics at the Center; or c) completion of the University College course 39.511, Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.

A significant number of elective courses are allowed, to permit each student to select, with his adviser, a sequence of courses which will represent examination in some depth of a subject of particular interest. Ordinarily, these courses would not be distributed over more than two subject areas.

## MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree

	Quarter 1	Quarter 2	Quarter 3
1st Year	Medical Terminology I Mgmt. & Org. I Math. I	Comp. I Mgmt. & Org. II Math. II	Comp. II Mgmt. & Org. III Math. III
2nd Year	Western Civ. I Acctg. I *Integ. Sci. I	Western Civ. II Acctg. II *Integ. Sci. II	Western Civ. III Acctg. III *Integ. Sci. III
3rd Year	Psych. I Elective Intro. to Lit. Forms I	Psych. II Elective Intro. to Lit. Forms II	Psych. III Elective Hospital Law
4th Year	Ind. Pysch. Pers. Mgmt. I Found. Med. Sci. I	Human Rel. I Pers. Mgmt. II Found. Med. Sci. II	Human Rel. II Pers. Mgmt. III Found. Med. Sci. III
5th Year	Econ. I Fine Arts Mgmt. Elective Literature	Econ. II Fine Arts Mgmt. Elective Literature	Econ. III Fine Arts Mgmt. Elective Literature
6th Year	Soc. I E.D.P. I L.A. Elective Corp. Fin. I	Soc. II E.D.P. II L.A. Elective Corp. Fin. II	Soc. III E.D.P. III L.A. Elective Corp. Fin. III
7th Year	Pol. Sci. I Hospital Org., Long-Term C., or Pub. Health I Elective Elective Elective	Pol. Sci. II Hospital Org., Long-Term C., or Pub. Health II Elective Elective Elective	Pol. Sci. III Hospital Org., Long-Term C. II, or Per. Comm. Health Elective Elective Elective
8th Year	Phil. I Elective Elective	Phil. II Elective Elective	Phil. III Elective Elective

\*Science courses with equivalent subject content may be substituted for Integrated Science with approval of Program Director.

**NURSING HOME ADMINISTRATION**

In order to meet the immediate need of nursing home administrators for a relatively short term educational program while still providing academically structured courses that will subsequently apply to a degree program, the following sequence of courses is offered.

19.501,	19.502,	19.503	Psychology I, II, III	6
		19.532	Industrial Psychology	2
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
	45.511,	45.512	Human Relations in Personnel I, II	4
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
		86.507	Medical Terminology	2
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III	6
				—
<b>Total Credits</b>				<b>40</b>

Successful completion of this course of study with a quality point average of 2.00 will entitle the student to a letter attesting to this accomplishment and will, in the opinion of many who are knowledgeable in the field of nursing home administration, adequately prepare the student to meet present licensure examinations. Students in this program are eligible to apply for matriculation in the baccalaureate program "Management in Health Agencies and Institutions" (page 114).

Completion of this sequence of courses and possession of the letter documenting this fact does not constitute graduation from University College.

Through the Center for Continuing Education, Northeastern offers a unique series of week-long residential institutes for nursing home administrators, which do not carry academic credit. For information about this program, contact the Center for Continuing Education.

**Program Consultant:**

*Robert R. Lovejoy, M.S.  
Director, Waltham Hospital*

**Course Consultant:**

*Jack Chilnick, B.S.  
Executive Director, Jewish Rehabilitation  
Center for the Aged of the North Shore*

**Nursing Home Administration**

**Recommended course sequence for the 40 q.h. credit program  
leading to the Certificate Letter:**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st</b>	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
<b>Year</b>	Found. Med. Sci. I	Found. Med. Sci. II	Found. Med. Sci. III
	Psych. I	Psych. III	Psych. III
	Med. Term.		Hosp. Law & Ethics
<b>2nd</b>	Acctg. I	Acctg. II	Acctg. III
<b>Year</b>	Ind. Psych. I	Human Relat. I	Human Relat. II
	Long-Term Care I	Long-Term Care II	Long-Term Care III

**MEDICAL RECORDS SCIENCE****Bachelor of Science Degree**

and qualification for admission to the professional registration examinations conducted by the American Association of Medical Record Librarians

*Note: This program is also offered on a full-time (day) basis.*

*The information below refers only to the part-time (evening) program; information about the day program may be obtained by contacting the Division of Health Sciences.*

Northeastern University's Programs in Medical Record Science are approved by the American Medical Association's Council on Medical Education, collaboration with the Committee on Education and Registration of the American Association of Medical Record Librarians.

**MEDICAL RECORDS SCIENCE****Bachelor of Science Degree****Basic Courses—required****quarter hours**

10.501,	10.502,	10.503	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
				—	

**Core Courses—required***Liberal Arts*

18.311,	18.312,	18.313	General Biology and Laboratory I, II, III	12	
18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:			English, American or other in translation	6	
Fine Arts:			Art, Music, or Theatre Arts	6	50
				—	

*Management*

45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	16
				—	

(continued on following page)

*Health Care Administration*

		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
	86.507,	86.508	Medical Terminology I, II	<u>4</u>	12

**Major Concentration Courses—required**

86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6	
86.554,	86.555,	86.556	Medical Records Science I, II, III	12	
	86.557,	86.558	Medical Records Science IV, V	<u>8</u>	26

**Elective Courses**

Liberal Arts	6	
From Any Area	<u>32</u>	<u>38</u>
<b>Total Credits</b>		<b>174</b>

In addition to completing the academic requirements, candidates for a degree with a major in Medical Records Science must also complete a minimum of 300 clock hours of supervised practice experience in affiliated hospitals. This experience is coordinated with the course work in the major field.

Candidates who wish to major in this program must be interviewed by the Assistant Director, Medical Records Science program. Arrangements for this interview may be made through the University College Office. No candidate will be considered as matriculated until this requirement has been met.

**Note:** *In addition to the required coursework and clinical practice, students must demonstrate proficiency in descriptive statistics to qualify for the degree in this program. See Note on Page 115 for detail of alternate ways in which this requirement may be satisfied.*

(continued on following page)

**Recommended Course Sequence for the 8-Year program Leading to the Bachelor of Science Degree in Medical Records Science and qualification.**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	Comp. and Rhet. I Mgmt. & Org. I Math. I	Comp. and Rhet. II Mgmt. & Org. II Math. II	Elective Mgmt. & Org. III Math. III
<b>2nd Year</b>	West. Civ. I Gen. Biol. & Lab. I Elective	West. Civ. II Gen. Biol. & Lab. II Elective	West. Civ. III Gen. Biol. & Lab. III Elective
<b>3rd Year</b>	Psych. I Anat. & Physiol. I Med. Termin. I Lit. I	Psych. II Anat. & Physiol. II Med. Termin. II Lit. II	Psych. III Anat. & Physiol. III Hospital Law Elective
<b>4th Year</b>	Literature Soc. I Ind. Psych. Found. Med. Sci. I	Literature Soc. II Human Rel. I Found. Med. Sci. II	Literature Soc. III Human Relations II Found. Med. Sci. III
<b>5th Year</b>	Econ. I Fine Arts Med. Rec. Sci. I	Econ. II Fine Arts Med. Rec. Sci. II	Econ. III Fine Arts Med. Rec. Sci. III
<b>6th Year</b>	Med. Rec. Sci. IV* Electives	Med. Rec. Sci. V* Electives	Electives
<b>7th Year</b>	Pol. Sci. I Org. Med. Rec. I L.A. Elective	Pol. Sci. II Org. Med. Rec. II L.A. Elective	Pol. Sci. III Org. Med. Rec. III L.A. Elective Elective
<b>8th Year</b>	Phil. I E.D.P. I Elective	Phil. II E.D.P. II Elective	Phil. III E.D.P. III Elective

\*Required clinical experience hours must be arranged in relation to courses starred.



**MEDICAL RECORDS SCIENCE****Certification Program**

Candidates who wish to qualify for admission to the professional examination for registration as a record librarian (R.R.L.), and who already hold a bachelor's degree in another field from a college or university acceptable to Northeastern, may undertake the following course work. Successful completion of this course sequence with a cumulative quality point average of 2.00 will lead to certification from University College that the candidate has completed a professional program in Medical Records Science.

**Courses required for Professional Certification:**

				quarter hours
18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
	86.507,	86.508	Medical Terminology I, II	4
86.554,	86.555,	86.556	Medical Records Science I, II, III	12
	86.557,	86.558	Medical Records Science IV, V	8
86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6
			One course in Principles of Electronic Data Processing	2
				—
<b>Total Credits</b>				<b>52</b>

In addition to completion of the academic requirements, candidates for certification must complete a minimum of 300 clock hours of supervised practice experience in affiliated hospitals. This experience is coordinated with the course work in the major field.

Candidates who wish to matriculate in this program must be interviewed by the Assistant Director, Medical Records Science program. Arrangements for this interview may be made through the Division of Health Sciences. No candidate will be considered as matriculated until this requirement has been met.

**Note:** In addition to the required coursework and clinical practice, students must demonstrate proficiency in descriptive statistics to qualify for the certificate in his program. See Note on Page 115 for detail of alternate ways in which this requirement may be satisfied.

**Note:** This sequence is available through the evening program only.

**MEDICAL RECORDS SCIENCE****Recommended Course Sequence for the 3-Year Program  
Leading to a Certificate in Medical Records Science**

(This program is open to candidates who hold an  
acceptable baccalaureate degree only.)

*Prerequisite:* A college-level course in General Biology

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st</b>	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
<b>Year</b>	Anat. & Physiol. I	Anat. & Physiol. II	Anat. & Physiol. III
	Found. Med. Sci. I	Found. Med. Sci. II	Found. Med.
	Med. Termin. I	Med. Termin. II	Sci. III
<b>2nd</b>	Med. Rec. Sci. I	Med. Rec. Sci. II	Med. Rec. Sci. III
<b>Year</b>	Org. Med. Rec. I	Org. Med. Rec. II	Org. Med. Rec. III
		E.D.P. I	Hospital Law
<b>3rd</b>	*Med. Rec. Sci. IV	*Med. Rec. Sci. V	
<b>Year</b>			

**Hospitals Affiliated as Primary Teaching Units**

Beth Israel Hospital, Boston  
 Children's Hospital Medical Center, Boston  
 Massachusetts General Hospital, Boston  
 Peter Bent Brigham Hospital, Boston  
 Public Health Service Hospital, Boston

**Curriculum Advisory Committee in Medical Records Science**

Ellen Fitzgerald, R.R.L.  
 Children's Hospital Medical Center, Boston  
 Janice E. Gardner, R.R.L.  
 Ayer Community Hospital, Ayer  
 Joyce Gormley, R.R.L.  
 Massachusetts General Hospital, Boston  
 Marjorie Gurney, R.R.L.  
 Blue Cross – Blue Shield, Boston  
 Dorothy Richmond, R.R.L.  
 Beth Israel Hospital, Boston  
 Susan Winship, R.R.L.  
 Northern Essex Community College, Haverhill

**Ex-Officio Members**

Rina L. Zamczyk, R.R.L.  
 Technical Director of Program  
 John W. Schermerhorn, Ph.D.  
 Dean, Division of Health Sciences

\*Required clinical experience hours must be arranged in relation to courses starred.

**RESPIRATORY THERAPY ASSOCIATE IN SCIENCE DEGREE**

As medical knowledge has advanced and become highly specialized, trained personnel in the fields related to medicine have become important members of the health care team. As members of this team, Respiratory Therapists support and assist the physician toward the goal of optimum patient care by using many different treatments and rehabilitative procedures to help patients with respiratory problems. They work with such modern complex facilities as electronic respirators, ultrasonic nebulizers, blood gas machines, and pulmonary function equipment.

As physicians rely more and more on specialized techniques and equipment, the Respiratory Therapist will play an increasingly important role in patient care.

The man or woman entering this field now is joining a rapidly expanding specialty and can expect to grow with the field. The demand for skilled registered Respiratory Therapists is high, and opportunities are unlimited throughout the world.

The full program on a full-time basis requires three years for completion, the last two spent in 4 academic quarters which alternate with an internship quarter and two paid quarters of clinical work. The first year of this program may be completed by study on a part-time basis over two or more years. An interview with the program faculty is required prior to registration in 86.591, Introduction to Respiratory Therapy I. The candidate who completes this part-time study with a cumulative average "c" or better may then apply for admission directly into the second year full-time program.

**RESPIRATORY THERAPY (FULL-TIME)****Associate in Science Degree****Basic Courses—required****Quarter hours**

10.101,	10.102,	10.103	Basic Math	9	
		19.102	Basic Psychology	4	
		23.210	The U.S. to 1865	4	
		23.211	The U.S. since 1865	4	
30.113,	30.114		English	8	29
				—	

**Core Courses—required****Liberal Arts**

18.114,	18.115	Functional Human Anatomy	10*	
	29.100	Public Speaking	3	
	18.120	Microbiology	4	
	11.171	Basic Physics I	4	21
			—	

\*Science courses with equivalent subject content may be substituted for integrated Science with approval of Program Director.

**Health Care**

	86.502	Hospital Law & Ethics	2	
	86.503	Emergency Procedures	2	
	86.511	Personal & Community Health	2	
86.512,	86.513	Found. of Med. Sci. I, II	6	
	86.524	Health Education	2	
86.574,	86.575	Health, Disease & Disability	6	20
			—	

**Major Concentration courses—required**

86.591,	86.592,	86.593	Intro. to Resp. The. I, II, III	9	
	86.594,	86.596	Proc. in Resp. The. I, & III	8	
		86.595	Clinical Internship	4	
	86.597,	86.598	Proc. in Resp. The. IV & V	8	29
				—	

**Elective Courses**

	Liberal Arts	8	8
		—	107

**Course Sequence**

	<b>Quarter I</b>	<b>Quarter II</b>	<b>Quarter III</b>
<b>*1st</b>	Func. Hu. Anat.	Func. Hu. Anat.	Micro.
<b>Year</b>	**Intro. Resp. Th. I	Intro. Resp. Th. II	Intro. Resp. Th. III
	Math I	Math II	Math III
	Physics I	English I	English II
			Hospital Law
<b>2nd</b>	Proc. Resp. Th. I	Clin. Internship	Proc. Resp. Th. III
<b>Year</b>	Public Spkg.		Psych.
	U.S. to 1865		U.S. since 1865
	Med. Sci.		Med. Sci.
<b>3rd</b>	Co-op period	Proc. Resp. Th. IV	Proc. Resp. Th. V
<b>Year</b>		Emerg. Proc.	Health Ed.
		Elective	Elective
		Health, Dis., Disab.	Health, Dis., Disab.
		Pers. & Comm. Health	

**Medical Advisory Committee**

Leonard Bushnell, M.D., Beth Israel Hospital  
 Dean S. Crocker, M.D., Children's Hospital Medical Center  
 John Hedley-Whyte, M.D., Beth Israel Hospital  
 Henning Pontoppidan, M.D., Massachusetts General Hospital  
 LeRoy Van Dam, M.D., Peter Bent Brigham Hospital

**Ex Officio:**

Dean Crocker, M.D., Medical Consultant  
 Evelyn L. Cassara, B.S., R.N., A.R.I.T., Program Director  
 John W. Schermerhorn, Ph.D., Dean, Division of Health Sciences

\*First year may be taken on a part-time or full-time basis, years 2 and 3 must be full-time.  
 \*\*Interview with Program Director required prior to registration.

**LINCOLN COLLEGE/UNIVERSITY COLLEGE  
AFFILIATED PROGRAMS****Science Technology Related Program**

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related subjects. The Chemical-Biological Technology program leads to the Bachelor of Science degree from University College.

**Allied-Medical Technology Related Programs**

A program in Cytotechnology is offered through the cooperating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the broader field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but a sound academic background.

The program in Medical Technology is a joint Lincoln College—University College program which is conducted in affiliation with several hospital schools of medical technology approved by the American Medical Association. The program leads to the Bachelor of Science degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors, and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

**CHEMICAL-BIOLOGICAL TECHNOLOGY****Leading to the Degree of Bachelor of Science**

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of Chemistry and Biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical and hospital laboratories dealing with analytical, production, and research functions, and in secondary school education in the teaching of general science, chemistry, biology, and other related courses.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

			<b>FIRST YEAR</b>	<b>Q.H.</b>
Course Number		Course		
10.501, 10.502, 10.503		Mathematics I, II, III		6
		or		
	10.307, 10.308	*College Algebra and Trigonometry I, II		8
11.304, 11.305, 11.306		General Physics, I, II, III		6
12.314, 12.315, 12.316		General Chemistry and Lab. I, II, III		9
30.601, 30.602		Composition and Rhetoric I and II		4
		English Elective		2
			<b>SECOND YEAR</b>	
10.316, 10.317, 10.318		Probability and Statistics I, II, III	}	6
		or		
10.320, 10.321, 10.322		Calculus I, II, III		8
18.311, 18.312, 18.313		Biology I, II, III		12
23.501, 23.502, 23.503		Western Civilization I, II, III		6
			<b>THIRD YEAR</b>	
12.321, 12.322, 12.323		Analytical Chemistry I, II, III		6
12.324, 12.325, 12.326		Analytical Chemistry Lab. I, II, III		6
18.324, 18.325, 18.326		Human Anatomy and Physiology I, II, III		9
19.501, 19.502, 19.503		Psychology I, II, III		6
			<b>FOURTH YEAR</b>	
12.331, 12.332, 12.333		Organic Chemistry I, II, III		6
12.334, 12.335, 12.336		Organic Chemistry Lab. I, II, III		6
18.321, 18.322, 18.323		Microbiology I, II, III		12
			<b>FIFTH YEAR</b>	
18.351, 18.352, 18.353		Histology-Organology I, II, III		6
39.501, 39.502, 39.503		Economic Principles and Problems I, II, III		6
12.351, 12.352, 12.353		Instrumental and Radiochemistry I, II, III		6
16.531, 16.532, 16.533		Oceanography I, II and Marine Geology		6
			<b>SIXTH YEAR</b>	
18.361, 18.362, 18.363		Ecology I, II, III		6
73.311, 73.312, 73.313		Clinical Biochemistry I, II, III		6
21.501, 21.502, 21.503		Sociology I, II, III		6
		*Elective		6
			<b>SEVENTH YEAR</b>	
18.357, 18.358, 18.359		Genetics I, II, III		6
30.604, 30.605		Intro. to Literary Forms I and II		4
		English Elective		2
		*Elective		6
		*Elective		6

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 Total B.S. degree 174-178

**CHEMICAL-BIOLOGICAL TECHNOLOGY****Leading to the Degree of Associate in Science**

The program in Chemical-Biological Technology provides the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically, or biologically oriented organizations, and for persons having various paramedically related responsibilities. Employment opportunities are in general hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments, and in the emerging fields of the oceanographic technologies.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

**FIRST YEAR**

Course Number	Course	Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III	6
	or	
10.307, 10.308	College Algebra and Trigonometry I, II	8
11.304, 11.305, 11.306	General Physics I, II, III	6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III	9
30.601, 30.602	Composition and Rhetoric I and II	4
	English Elective	2

**SECOND YEAR**

10.316, 10.317, 10.318	Probability and Statistics I, II, III	}	6
	or		
10.320, 10.321, 10.322	Calculus I, II, III		8
	Social Science Elective I, II, III		6
18.311, 18.312, 18.313	Biology I, II, III		12

**THIRD YEAR**

12.331, 12.332, 12.333	Organic Chemistry I, II, III	}	6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III		6
	or		
12.321, 12.322, 12.323	Analytical Chemistry I, II, III	}	
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III		
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III		9
	*Humanities Elective I, II, III		6

**FOURTH YEAR**

18.321, 18.322, 18.323	Microbiology I, II, III	12
	*Biology or Chemistry Elective I, II, III	6

Total A.S. degree 96-100

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

\*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.



**CYTOTECHNOLOGY****Leading to the Degree of Bachelor of Science**

A program offered through the cooperating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science Degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the broader field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but also sound academic background.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

**FIRST YEAR**

Course Number	Course		Q.H.
10.501, 10.502, 10.503	Mathematics I, II, III		6
	or		
10.307, 10.308	*College Algebra and Trigonometry I, II		8
11.304, 11.305, 11.306	General Physics I, II, III		6
12.314, 12.315, 12.316	General Chemistry and Lab. I, II, III		9
30.601, 30.602	Composition and Rhetoric I and II		4
	English Elective		2

**SECOND YEAR**

10.316,	10.317,	10.318	Probability and Statistics I, II, III	}	6
			or		or
10.320,	10.321,	10.322	Calculus I, II, III		8
18.311,	18.312,	18.313	Biology I, II, III		12
23.502,	23.503,	23.504	Western Civilization I, II, III		6

**THIRD YEAR**

12.321, 12.322, 12.323	Analytical Chemistry I, II, III		6
12.324, 12.325, 12.326	Analytical Chemistry Lab. I, II, III		6
18.324, 18.325, 18.326	Human Anatomy and Physiology I, II, III		9
19.501, 19.502, 19.503	Psychology I, II, III		6

**FOURTH YEAR**

12.331, 12.332, 12.333	Organic Chemistry I, II, III		6
12.334, 12.335, 12.336	Organic Chemistry Lab. I, II, III		6
18.321, 18.322, 18.323	Microbiology I, II, III		12



**FIFTH YEAR**

18.351,	18.352,	18.353	Histology-Organology I, II, III	6
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	} 6
			or	
86.507,	86.508,	86.502	Medical Terminology I, II, Hospital Law and Ethics	
	12 months		AMA-Approved Hospital School of Cytotechnology Internship	15

**SIXTH YEAR**

39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
73.311,	73.312,	73.313	Clinical Biochemistry I, II, III	6
			Elective	6
			Elective	6

**SEVENTH YEAR**

18.341,	18.342,	18.343	Hematology I, II, III	6
	30.604,	30.605	Intro. to Literary Forms I, II	4
			English Elective	2
			Elective	6

Total B.S. degree 176 minimum

**MEDICAL TECHNOLOGY****Bachelor of Science Degree**

The program in Medical Technology is a joint Lincoln College-University College program which is conducted in affiliation with several Hospital Schools of Medical Technology approved by the American Medical Association. The program leads to the Bachelor of Science Degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

The Registered Medical Technologist is in constant demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations and in the Armed Forces.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

**FIRST YEAR**

Course Number			Course	Q.H.	
10.501,	10.502,	10.503	Mathematics I, II, III	}	6
			or		
	10.307,	10.308	College Algebra and Trigonometry I, II	}	8
11.304,	11.305,	11.306	General Physics I, II, III		6
12.314,	12.315,	12.316	General Chemistry and Lab. I, II, III	}	9
	30.601,	30.602	Composition and Rhetoric I and II		4
			English Elective		2

**SECOND YEAR**

10.316,	10.317,	10.318	Probability and Statistics I, II, III	}	6
			or		
10.320,	10.321,	10.322	Calculus I, II, III	}	8
18.311,	18.312,	18.313	Biology I, II, III		12
23.501,	23.502,	23.503	Western Civilization I, II, III		6

**THIRD YEAR**

12.331,	12.332,	12.333	Analytical Chemistry I, II, III		6
12.324,	12.325,	12.326	Analytical Chemistry Lab. I, II, III		6
18.324,	18.325,	18.326	Human Anatomy and Physiology I, II, III		9
19.501,	19.502,	19.503	Psychology I, II, III		6

## FOURTH YEAR

12.331,	12.332,	12.333	Organic Chemistry I, II, III	6
12.334,	12.335,	12.336	Organic Chemistry Lab. I, II, III	6
18.321,	18.322,	18.323	Microbiology I, II, III	12

## FIFTH YEAR

73.311,	73.312,	37.313	Clinical Biochemistry I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	} 6
		or		
12.351,	12.352,	12.353	Instrumental and Radiochemistry I, II, III	
			Elective	6

## SIXTH YEAR

12 months Internship at a A.M.A.-Approved Hospital School of Medical Technology	30
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## SEVENTH YEAR

18.341,	18.342,	18.343	Hematology I, II, III	6
	30.604,	30.605	Intro. to Literary Forms I, II	4
			English Elective	2
18.357,	18.358,	18.359	Genetics I, II, III	6
			Elective	6

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Total B.S. degree 180-184

# education

## GENERAL OBJECTIVES

The teacher education program in University College is deeply concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described and the several ways of assessing it are outlined.

**Objective I:** *Every teacher should be broadly educated.*

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work, social science, United States history, American literature, effective speaking, human development, and English. Second, all students must complete a minimum of 16 credits in each of the following areas: science and mathematics, humanities, and social sciences.

**Objective II:** *Every teacher should achieve an expertness in some field of knowledge.*

The teacher education program in University College offers an academic major in the field of English. The major is designed to prepare English teachers for the junior or senior high school. It will also provide a basis for specialized graduate study in English as well as in education.

**Objective III:** *Each teacher should be professionally prepared for the position of his choice.*

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous years. Beginning students will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

## Admission Requirements

Important to the future teacher is high ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

Upon completion of all courses (or their equivalent) listed under Quarters 1–6 on p. 135, students desiring certification must apply to the College of Education for admission to the professional sequence of the teacher education program. They will be expected to present such evidence as the College of Education shall require. Evaluations will be made on academic aptitude, verbal fluency, interest in working with young people, and emotional maturity. A serious attempt will be made to assess these factors in their interrelationships rather than as isolated phenomena. Students accepted into the professional sequence of the College of Education will be expected to commit themselves to the remaining requirements of the program.

## Transfers

Students admitted to advanced standing in University College (see p. 30) may apply for admission to the professional sequence on the basis of satisfactory grades received in courses which are the equivalent of those required for entering Quarter 7 (see p. 135). Credit toward electives may be earned by means of the College Level Examination Program (see p. 30).

## GRADUATION REQUIREMENTS

### Degrees

University College will award the degree of Bachelor of Science to those who successfully complete the program of preparation for teaching English at the secondary school level.

### Quantitative Requirements

The required courses in the curriculum for the teaching of English are listed on a following page. The curriculum requires not less than 173 quarter hours of class work, including one quarter of student teaching. At least 45 quarter hours will be required in education, including student teaching.

### Elective Courses

Elective courses, approved by the College of Education adviser, will be selected by the student from among courses in University College, or credit may be earned by means of the College Level Examination Program.

### Qualitative Requirements

Students in the teacher education program in University College will be expected to maintain an over-all average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order

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\*One of the Basic (day) Colleges of Northeastern University

to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

#### *Graduation with Honor*

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

#### **National Teacher Examinations**

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

#### **Programs of Instruction**

The teacher education program in University College offers an academic major in the field of English (in grades 7–12). A specimen program is shown on the following page.

#### **Accreditation**

Northeastern University's College of Education is accredited by the National Council for Accreditation of Teacher Education. The College is a member of the American Association of Colleges for Teacher Education.

**SPECIMEN PROGRAM IN TEACHING OF ENGLISH (IN GRADES 7-12)**

*This program is designed with the assumption that the student is attending college on approximately a half-time basis.*

**First Year****QUARTER 1**

No.	Course	Cl.	q.h.
16.501	Nat. Sci. I	2	2
23.501	West. Civ. I	2	2
29.501	Eff. Spkg. I	2	2
30.601	Comp. & Rhet. I*	2	2

**QUARTER 2**

No.	Course	Cl.	q.h.
16.502	Nat. Sci. II	2	2
23.502	West. Civ. II	2	2
29.502	Eff. Spkg. II	2	2
30.602	Comp. & Rhet. II	2	2

**QUARTER 3**

No.	Course	Cl.	q.h.
16.503	Nat. Sci. III	2	2
23.503	West. Civ. III	2	2
29.503	Eff. Spkg. III	2	2
30.604	Intro. to Lit. Forms I	2	2

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24**Second Year****QUARTER 4**

No.	Course	Cl.	q.h.
22.501	Prin. Pol. Sci. I	2	2
30.605	Intro. to Lit. Forms II	2	2
50.111	Soc. Sci. I	3	3

**QUARTER 5**

No.	Course	Cl.	q.h.
22.502	Prin. Pol. Sci. II	2	2
	English Elective	2	2
50.112	Soc. Sci. II	3	3

**QUARTER 6**

No.	Course	Cl.	q.h.
22.503	Prin. Pol. Sci. III	2	2
	English Elective	2	2
50.113	Soc. Sci. III	3	3

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21**Total Credits**

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45

*Students desiring certification must now apply to the College of Education\* for admission to the teacher education program.*

**Third Year****QUARTER 7**

No.	Course	Cl.	q.h.
23.527	England 500-1603	2	2
26.501	Intro. Phil. I	2	2
30.525	English Language I	2	2
39.501	Ec. Prin. & Prob. I	2	2

**QUARTER 8**

No.	Course	Cl.	q.h.
23.548	England 1603-1815	2	2
26.502	Intro. Phil. II	2	2
30.526	English Language II	2	2
39.502	Ec. Prin. & Prob. II	2	2

**QUARTER 9**

No.	Course	Cl.	q.h.
23.549	England Since 1815	2	2
26.503	Intro. Phil. III	2	2
30.527	English Language III	2	2
39.503	Ec. Prin. & Prob. III	2	2

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24**Fourth Year****QUARTER 10**

No.	Course	Cl.	q.h.
23.504	U.S. History I	2	2
30.541	English Lit. I	2	2
50.121	Hum. Dev. & Learn. I	4	4

**QUARTER 11**

No.	Course	Cl.	q.h.
23.505	U.S. History II	2	2
26.534	Logic	2	2
30.542	English Lit. II	2	2
	Electives	2	2

**QUARTER 12**

No.	Course	Cl.	q.h.
23.506	U.S. History III	2	2
30.543	English Lit. III	2	2
50.131	Hum. Dev. & Learn. II	4	4

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\*An English placement examination must be taken prior to registration. If the score is not satisfactory, students should enroll for 30.600, Elements of Composition, a 2 q.h. credit course designed to improve command of written English. Then proceed with 30.601, 602, 603, 604 and a 2 q.h. English elective in Quarter 6.

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## Fifth Year

## QUARTER 13

No.	Course	Cl.	q.h.
30.522	Intro. Semantics I	2	2
30.544	Amer. Lit. I	2	2
51.135	Anal. Tchng. & Ed. Proc.	4	4

## QUARTER 14

No.	Course	Cl.	q.h.
30.523	Intro. Semantics II	2	2
30.545	Amer. Lit. II	2	2
	Electives	4	4

## QUARTER 15

No.	Course	Cl.	q.h.
	Elective	2	2
30.546	Amer. Lit. III	2	2
54.126	Sec. Reading	4	4

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 24

## Seventh Year

## QUARTER 19

No.	Course	Cl.	q.h.
	Sci. or Math. Elec.	2	2
	Art Music or Thea.		
	Art	2	2
50.151	Bckgrnds. Amer. Ed.	4	4

## QUARTER 20

No.	Course	Cl.	q.h.
	Sci. or Math. Elec.	2	2
	Art Music or Thea.		
	Art	2	2
	Electives	4	4

## QUARTER 21

No.	Course	Cl.	q.h.
	Sci. or Math. Elec.	2	2
	Art Music or Thea.		
	Art	2	2
50.143	M & M—English	4	4

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## Sixth Year

## QUARTER 16

No.	Course	Cl.	q.h.
30.517	Intermed. Wrtg.	2	2
30.554	Shakespeare I	2	2
50.141	Meas. & Eval.	4	4

## QUARTER 17

No.	Course	Cl.	q.h.
30.518	Creative Wrtg. I	2	2
30.555	Shakespeare II	2	2
	Electives	4	4

## QUARTER 18

No.	Course	Cl.	q.h.
30.519	Creative Wrtg. II	2	2
30.556	Shakespeare III	2	2
	Electives	4	4

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## Eighth Year

## QUARTER 22

No.	Course	Cl.	q.h.
51.151	Student Teaching	8	

8

Total Credits

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 173



# course descriptions

## Abbreviations

Q. H. = Quarter Hours (credit earned)

Cl. = Hours required in class per week

Prereq. = Prerequisite

## 10—MATHEMATICS

*Consultant:* Prof. E. M. Cook, Math Dept. (L.A. College)

*Course Coordinator:* J. J. Hansen

Students intending to enroll in Mathematic 10.501 or 10.507 will be given a Mathematics Placement Test during the registration period. A satisfactory score in this test will entitle the student to enroll in course 10.501 or 10.507, while an unsatisfactory score will require that he enroll in the non-credit course 10.330 for additional preparation.

### 10.330 Basic Mathematics I (2 cl., non-credit)

A review of elementary algebra: algebraic expressions and operations, equations, word problems. *Prereq.* None.

### 10.331 Basic Mathematics II (2 cl., non-credit)

Further review: operations with polynomials, factoring, fractional expressions, word problems. *Prereq.* 10.330.

### 10.501 Mathematics I (2 cl., 2 q.h.)

Methods and applications of algebra, graphical techniques. *Prereq.* *Math Placement Test* or 10.302, or 10.331.

### 10.502 Mathematics II (2 cl., 2 q.h.)

Linear and quadratic equations, exponents and radicals, variation. *Prereq.* 10.501.

### 10.503 Mathematics III. (2 cl., 2 q.h.)

Review of geometry; topics of trigonometry, introduction to statistics and probability, logarithms. *Prereq.* 10.502 or equiv.

### 10.504 Mathematics for Business Management I (2 cl., 2 q.h.)

Introduction to mathematics underlying operations research, with emphasis on applications to business management logic, set theory. *Prereq.* 10.503 or equiv.

### 10.505 Mathematics for Business Management II (2 cl., 2 q.h.)

Probability and its uses in decision-making under uncertainty; introduction to vector and matrix algebra. *Prereq.* 10.504 or equiv.

**10.506 Mathematics for Business Management III** (2 cl., 2 q.h.)

Mathematics of finance, linear programming and optimization techniques, game theory. *Prereq.* 10.505 or equiv.

**10.507 Mathematics (Intensive)** (6 cl., 6 q.h.)

Methods and applications of algebra, graphical techniques. Linear and quadratic equations, exponents and radicals, variation. Review of geometry, topics of trigonometry, introduction to statistics and probability, logarithms. Not open to students who have taken 10.501, 10.502, or 10.503. *Prereq.* *Math Placement Test*, 10.302, 10.331, or equiv.

**10.591 Mathematics A** (3 q.h.)

Same as 10.501 plus the first half of 10.502. *Prereq.* *Math Placement Test* or 10.302 or 10.331 or equiv.

**10.592 Mathematics B** (3 q.h.)

Same as the second half of 10.502 plus 10.503. *Prereq.* 10.591 or equiv.

**10.316 Probability and Statistics I** (2 cl., 2 q.h.)

Basic tools, e.g., sets, permutations and combinations; probability and applications. *Prereq.* 10.503, or 10.507, or 10.508.

**10.317 Probability and Statistics II** (2 cl., 2 q.h.)

Descriptive statistics, frequency distributions and probability density functions, normal and other distributions. *Prereq.* 10.316.

**10.318 Probability and Statistics III** (2 cl., 2 q.h.)

Bivariate distributions, correlation, statistical inference and estimation, regression. *Prereq.* 10.317.

**10.320 Calculus I** (4 cl. 4 q.h.)

Functions, graphs and limits; study of the straight line, the circle, the parabola; differentiation of algebraic functions, with applications, including the mean-value theorem; continuity. *Prereq.* 10.308 or 10.503 or 10.507.

**10.321 Calculus II** (2 cl., 4 q.h.)

Applications of derivatives to curve-sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions — logarithmic, exponential, and trigonometric. *Prereq.* 10.320.

**10.322 Calculus III** (2 cl. 4 q.h.)

Calculus of inverse trigonometric functions; techniques of integration — especially integration by parts, and substitution; numerical integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms, L'Hospital's rule; improper integrals. *Prereq.* 10.321.

**10.323 Calculus IV** (2 cl., 4 q.h.)

Calculus of functions of several variables, partial differentiation; multiple integrals; infinite series. *Prereq.* 10.322.

*For additional Mathematics courses consult the Lincoln College catalog.*

**10.324 Differential Equations I** (2 cl., 2 q.h.)

Vector analysis; matrices and linear algebra. *Prereq.* 10.323.

**10.325 Differential Equations II** (2 cl., 2 q.h.)

Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients. Laplace transforms.

*Prereq.* 10.324.

**11—PHYSICS****11.301 Introductory Physics I** (4 cl., non-credit)

A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. *Prereq.* None.

**11.302 Introductory Physics II** (4 cl., non-credit)

Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetism. *Prereq.* 11.301.

**11.304 General Physics I** (2 cl., 2 q.h.)

Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum. *Prereq.* 10.501 or concurrently.

**11.305 General Physics II** (2 cl., 2 q.h.)

Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. *Prereq.* 11.304.

**11.306 General Physics III** (2 cl., 2 q.h.)

Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq.* 11.305.

**12—CHEMISTRY****12.301 Introductory Chemistry I** (4 cl., non-credit)

A non-mathematical approach to the concepts of chemistry including matter, elements and compounds, chemical bonding, chemical equations. *Prereq.* none.

**12.302 Introductory Chemistry II** (4 cl., non-credit)

A continuation of 12.301, including periodic system, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry. *Prereq.* 12.301.

**12.307 Modern Chemistry (Intro. to Inorganic Chemistry)** (2 cl., 2 q.h.)

Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radioactivity, all discussed from the viewpoint of recent developments. *Prereq.* 10.501 or concurrently.

**12.308 Modern Chemistry (Intro. to Organic Chemistry) (2 cl., 2 q.h.)**

Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides, carbohydrates, including the relationship with modern biology. *Prereq.* 12.307.

**12.309 Modern Chemistry (Intro. to the Chemistry of Living Bodies)**

(2 cl., 2 q.h.)

Includes fats, proteins, enzymes, chemistry of digestion, and the chemical reactions characteristic of body fluids. *Prereq.* 12.308.

**12.311 General Chemistry I (2 cl., 2 q.h., summer term only)**

Fundamental ideas and energy, properties of gases, liquids and solids; atomic structure; chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes chemical equilibrium. *Prereq.* none.

**12.312 General Chemistry II (2 cl., 2 q.h., summer term only)**

Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of metals and non-metals; study of families of elements in the periodic system. *Prereq.* 12.311.

**12.313 General Chemistry III (2 cl., 2 q.h., summer term only)**

Chemistry of related and similar metals; coordination compounds; chemistry of organic compounds, both open and closed-chain compounds; organic chemistry of natural and synthetic products, including petroleum, rubber, synthetic resins, plastics, etc. *Prereq.* 12.312.

**12.314 General Chemistry and Laboratory I (2 cl., 2 lab., 3 q.h.)**

Fundamental ideas of matter and energy. Properties of gases, liquids and solids; atomic structure, chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium. Correlated laboratory experiments. *Prereq.* 10.307 or 10.501 or concurrently. (Laboratory Fee)

**12.315 General Chemistry and Laboratory II (2 cl., 2 lab., 3 q.h.)**

Ionic reactions and ionic equilibrium; oxidation-reduction reaction, electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of non-metals and metals; study of families of elements in the Periodic System. Correlated laboratory experiments. *Prereq.* 12.314. (Laboratory Fee)

**12.316 General Chemistry and Laboratory III (2 cl., 2 lab., 3 q.h.)**

Chemistry of related and similar metals; coordination compounds; chemistry of open and closed chain organic compounds; organic chemistry of natural and synthetic products including petroleum, rubber, synthetic resins, plastics, etc. Correlated laboratory experiments. *Prereq.* 12.315. (Laboratory Fee)

**16—EARTH SCIENCE**

*Consultant:* Prof. R. Overcash, Chairman, Earth Sciences (L.A. College)

**16.501 Earth Science I (2 q.h.)**

The earth in space, its motions and relationships with other bodies of the solar system. A brief look at modern astronomical developments.

**16.502 Earth Science II (2 q.h.)**

A closer examination of the earth begins with consideration of the atmosphere and the changes which take place within the atmosphere. The continental crusts and rocks and minerals are introduced. *Prereq.* 16.501 or *equiv.*

**16.503 Earth Science III (2 q.h.)**

The development of surface landscapes is considered by examining the geological work of water, ice, and wind. *Prereq.* 16.502 or *equiv.*

**16.504 Earth Science (Intensive) (6 q.h.)**

A single course, offered only in the summer, covering the same materials as that of 16.501, 502, 503. After thoroughly examining the earth and its position and relations in our solar system and galaxy, a closer look is given to the meteorological and geological forces that affect and shape the surface of the earth. (Not open to students who have taken 16.501, 16.502, and/or 16.503.)

**16.511 History of Science and Technology I (2 q.h.)**

An analysis of the varieties of cultures and civilizations from primitive man to the Roman Empire, emphasizing the interrelationships of science, technology, and society. *Prereq.* 16.503 or *equiv.*

**16.512 History of Science and Technology II (2 q.h.)**

A continuation of History of Science and Technology I covering the period from the Roman Empire to Sir Isaac Newton. *Prereq.* 16.511 or *equiv.*

**16.513 History of Science and Technology III (2 q.h.)**

A continuation of History of Science and Technology II covering the period from Sir Isaac Newton to the present. *Prereq.* 16.512 or *equiv.*

**16.521 Introduction to Geology (2 q.h.)**

Introduction to fundamental concepts of the earth and its crust. Consideration of the nature and properties of the materials composing the earth; the areal distribution of these materials, and the processes by which they are formed, altered, transported, and deposited; and the nature and development of the landscape. *Prereq.* 16.503 or *equiv.*

**16.522 Economic Mineralogy (2 q.h.)**

Introduction to the geological occurrence, mineralogy, use, and economics of the more important metallic and non-metallic minerals in the world today. International mineral problems will be discussed. *Prereq.* 16.503 or *equiv.*

**16.523 Gemology (2 q.h.)**

Introduction to the precious and semiprecious minerals of the earth's crust. Techniques of gem cutting, polishing, and faceting will be discussed in detail. Opportunity will be available to view and handle actual gem stones. *Prereq.* 16.503 or *equiv.*

**16.531 Oceanography I (2 q.h.)**

An introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world. *Prereq.* 16.503 or *equiv.*

**16.532 Oceanography II (2 q.h.)**

The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and nekton are discussed. The growing economic importance of marine resources for the expanding world population. *Prereq.* 16.531 or equiv.

**16.533 Marine Geology (2 q.h.)**

Physiography and structure of ocean basins. Marine geological processes and features including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration. *Prereq.* 16.503 or equiv.

**16.534 Fisheries Oceanography I (2 q.h.)**

Survey of commercially important marine organisms. An introduction to life histories and distribution of commercially important seaweed, shellfish, and fishes. Population dynamics and fishery potential of the world's oceans. An analysis of fishery stocks and sea farming. *Prereq.* 16.503 or equiv.

**16.535 Fisheries Oceanography II (2 q.h.)**

Commercial fishing methods, techniques, and equipment. Methods of harvesting the seas from past to present. An analysis of the various fisheries of the Atlantic Ocean with their equipment. Latest techniques of electric and photic fish capture. *Prereq.* 16.534 or equiv.

**16.536 Fisheries Oceanography III (2 q.h.)**

Commercial fishery products and their exploitation. A study of the commercial products and applications of marine organisms such as sea weed, fish, and shellfish. Particular emphasis on the marine products of commerce from the New England area. Chemical, industrial, and dietary applications of marine products. *Prereq.* 16.535 or equiv.

**16.541 Meteorology I (2 q.h.)**

Introduction to the structure, composition and phenomena of the atmosphere. Consideration of solar radiation, aurora, airglow, meteors and radio propagation in the upper atmosphere, followed by a detailed examination of the major weather elements, related measuring instruments and global wind circulation of the troposphere. Laboratory exercises include plotting horizontal and vertical variations in temperature, pressure, and moisture, with analysis of the dynamic inter-relationships involved. *Prereq.* 16.503 or equiv.

**16.542 Meteorology II (2 q.h.)**

Study of secondary wind circulation, air masses, frontal systems, thunderstorms, hurricanes, and tornadoes. Techniques in local short-range and regional long-range forecasting, with special attention to New England conditions. Laboratory exercises in synoptic weather maps preparation, analysis, and interpretation. *Prereq.* 16.541 or equiv.

**16.543 Climatology (2 q.h.)**

Classification, analysis, and geographic distribution of climatic types. Consideration of microclimates and relationship of weather and climatic elements to other factors in the natural environment and human activities. Opportunity provided to apply effects of these elements to a chosen area of personal interest. *Prereq.* 16.503 or equiv.

**16.551 Astronomy I (2 q.h.)**

Direction, orientation, and division of space and time. The six main types of bodies of the solar system in terms of their observed properties and motions. *Prereq.* 16.503 or *equiv.*

**16.552 Astronomy II (2 q.h.)**

Light as part of the electromagnetic spectrum and as a fundamental basis of man's observations. A survey of light and radio telescopes, spectroscopes, and other tools of astronomy. The sun as a typical star. *Prereq.* 16.551 or *equiv.*

**16.553 Astronomy III (2 q.h.)**

Stellar classification, variety, and evolution as fundamentals in the understanding of clusters, galaxies, and cosmology. *Prereq.* 16.552 or *equiv.*

**16.561 Physical Geography I (2 q.h.)**

The physical assessment of the earth as a globe; relations with the sun; geographic grid; map projections; illumination of the globe; geographic time studies and moon-tide relationships.

**16.562 Physical Geography II (2 q.h.)**

The physical weather elements of air temperature, pressure, moisture, and cyclonic storms; role of these elements in world climate. *Prereq.* 16.561 or *equiv.*

**16.563 Physical Geography III (2 q.h.)**

The earth's landforms; their formation and description. Landforms to be studied will include those formed by streams, glaciers, waves, and volcanoes. *Prereq.* 16.562 or *equiv.*

**16.567 Human and Cultural Geography (2 q.h.)**

A spatial analysis of people throughout the world—their culture, cultural landscapes, culture history, cultural ecology. An attempt is made to provide the basis for understanding differences in the character and compositions of the world populations.

**16.568 Urban Geography I (2 q.h.)**

An in-depth analysis of historical and present structures of cities; comparative world urbanism trends; historic city growth patterns; morphology; site and situation; central place theories; external and internal relations; economic base. The course is intended to provide a general knowledge of the city as it functions today. Not open to students who have had former course no. 16.566. *Prereq.* 16.567 or *equiv.*

**16.569 Urban Geography II (2 q.h.)**

An applied approach to urban problems through urban theories and planning techniques. Emphasis will be placed on vertical classification of cities, methods of city development, land utilization—internal and external, land-use survey and mapping techniques. Further analysis of planning approaches, zoning, and comprehensive plans will summarize the course of study. *Prereq.* 16.568 or *equiv.*



**16.571 Conservation of Natural Resources I (2 q.h.)**

The philosophy of conservation. Historical development of the conservation movement in the U.S. since 1900. Interactions of economics and conservation.

**16.572 Conservation of Natural Resources II (2 q.h.)**

Problems relating to the supply, use, and management of major renewable natural resources such as forests, soil, wildlife, and water. *Prereq.* 16.571 or equiv.

**16.573 Conservation of Natural Resources III (2 q.h.)**

Application of the theories and techniques of conservation to problems of urban resources, air and water pollution, recreational resources, and the availability of funds. *Prereq.* 16.572 or equiv.

## 18—BIOLOGY

**18.304 Integrated Science I (3 cl., 3 lab., 4 q.h.)**

Principles of chemistry, principles of biology. *Prereq.* None. (Laboratory Fee)

**18.305 Integrated Science II (3 cl., 3 lab., 4 q.h.)**

Human anatomy and physiology. *Prereq.* 18.304. (Laboratory Fee)

**18.306 Integrated Science III (3 cl., 3 lab., 4 q.h.)**

Introduction to essential topics in the major areas of biology; physico-chemical background of biology. *Prereq.* 18.305. (Laboratory Fee)

**18.311 General Biology (3 cl., 3 lab., 4 q.h.)**

Universal properties and processes of living organisms. Cellular composition and cellular activities; inheritance and cellular control; the evolutionary process; environmental relationships. *Prereq.* none.

**18.312 Animal Biology (3 cl., 3 lab., 4 q.h.)**

Systematic study of the structure and function of plants—principally vascular  
sity of animals considered from the standpoint of evolutionary adaptation.  
*Prereq.* 18.311.

**18.313 Plant Biology (3 cl., 3 lab., 4 q.h.)**

Systematic study of the structure and function of plants—principally vascular  
plants. Survey of the plant-like protists and monerans. *Prereq.* 18.311.

**18.314 Botany I (2 cl., 2 q.h.)**

The plant cell, tissues and parts of flowering plants. *Prereq.* 18.313.

**18.315 Botany II (2 cl., 2 q.h.)**

Classification of the plant kingdom, plantal life histories. *Prereq.* 18.314.

**18.316 Botany III (2 cl., 2 q.h.)**

Physiology and life activities of plants. *Prereq.* 18.315.

**18.321 Microbiology I (2 cl., 4 lab., 4 q.h.)**

Morphology and biochemistry of the bacteria. *Prereq.* 18.313. (Laboratory Fee)



**18.322 Microbiology II** (2 cl., 4 lab., 4 q.h.)

Biology of the protists; the role of microorganisms in the environment. *Prereq.*

18.321. (Laboratory Fee)

**18.323 Microbiology III** (2 cl., 4 lab., 4 q.h.)

Survey of pathogenic microorganisms. *Prereq.* 18.322. (Laboratory Fee)

**18.324 Human Anatomy and Physiology I** (2 cl., 2 lab., 3 q.h.)

The structure and function of vertebrate organ systems. *Prereq.* 18.306 or 18.313.

**18.325 Human Anatomy and Physiology II** (2 cl., 2 lab., 3 q.h.)

Introduction to cellular metabolism. *Prereq.* 18.324.

**18.326 Human Anatomy and Physiology III** (2 cl., 2 lab., 3 q.h.)

Continuation of the study of cellular metabolism. *Prereq.* 18.325.

**18.357 Genetics I** (1 cl., 2 lab., 2 q.h.)

Mitosis, meiosis, and mendelian genetics. *Prereq.* 18.313.

**18.358 Genetics II** (1 cl., 2 lab., 2 q.h.)

Chromosome mapping, mutation, translocation, chromosomal aberrations. *Prereq.* 18.357.

**18.359 Genetics III** (1 cl., 2 lab., 2 q.h.)

Population genetics, aspects of biochemical genetics. *Prereq.* 18.358.

*Consultant:* Prof. A. B. Warren, Chairman, Psychology Dept. (L.A. College)

*Associate Consultant:* Prof. H. S. Zamansky (L.A. College)

## 19—PSYCHOLOGY

*Consultant:* Prof. A. B. Warren, Chairman, Psychology Dept. (L.A. College)

*Associate Consultant:* Prof. H. S. Zamansky (L.A. College)

**19.501 Psychology I** (2 q.h.)

An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning.

**19.502 Psychology II** (2 q.h.)

Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq.* 19.501 or equiv.

**19.503 Psychology III** (2 q.h.)

Personality theory and measurement, behavior disorders, mental health and psychotherapy. *Prereq.* 19.502 or equiv.

**19.504 Statistics in Psychology I** (2 q.h.)

Scales of measurement in psychological research, measures of central tendency, and variability. *Prereq.* 19.503 or equiv.

**19.505 Statistics in Psychology II (2 q.h.)**

Measures of correlation, introduction to probability and statistical distributions. *Prereq.* 19.504 or equiv.

**19.506 Statistics in Psychology III (2 q.h.)**

Parametric and non parametric tests of significance, including chi square, t-test, F test, and simple analysis of variance. *Prereq.* 19.505.

Note: 19.504, 19.505, and 19.506 may not be taken in addition to Statistics (39.511, 39.512, 39.513). Psychology majors may substitute 39.511, 39.512, and 39.513 with permission of the Dean.

**19.507 Psychology (Intensive) (6 q.h.)**

An introductory survey of the historical backgrounds of psychology, psychological measurements and testing, and principles of animal and human learning. Principals of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurement, behavior disorders. mental health, and psychotherapy. Not open to students who have taken 19.501, 19.502, 19.503.

**19.508 Fundamentals of Psychology I (4 q.h.)**

Basic concepts from most areas of psychological investigation; the experimental orientation to the study of behavior, including child development, individual differences, learning, and social psychology. (Recommended for psychology majors.)

**19.509 Fundamentals of Psychology II (4 q.h.)**

The sensory basis of behavior, cognition, perception, motivation, emotions, normal and abnormal personality. (Recommended for psychology majors.) *Prereq.* 19.508 or equiv.

**19.511 Child Psychology I (2 q.h.)**

Genetic factors in development; biological, social, intellectual, and personality development during preschool years. *Prereq.* 19.503 or equiv.

**19.512 Child Psychology II (2 q.h.)**

Factors in psychological development during the middle-childhood years. *Pre-req.* 19.511.

**19.513 Adolescent Psychology (2 q.h.)**

Psychological and physical changes during adolescence, attitudes toward peer groups and parental figures, vocational choice, and the determination of moral standards and values. *Prereq.* 19.512 or equiv.

**19.521 Personality I (2 q.h.)**

Systematic study of the normal personality. A number of prominent theoretical approaches to personality will be considered including the psychoanalytic, constitutional, field, and stimulus-response. *Prereq.* 19.503 or equiv.

**19.522 Personality II (2 q.h.)**

Problems of adjustment, frustration, conflict, and stress. Adjustive behavior, mechanisms of defense, and minor personality maladjustments will be considered. *Prereq.* 19.521 or equiv.

**19.523 Motivation (2 q.h.)**

Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motive will be considered. *Prereq.* 19.522 or equiv.

**19.524 Social Psychology I (2 q.h.)**

The socialization process, social motives, interpersonal perception, group membership and structure. *Prereq.* 19.503 or equiv.

**19.525 Social Psychology II (2 q.h.)**

Attitudes, prejudice and ethnic relations, leadership, mass behavior and social movements, and the effects of mass media of communication. *Prereq.* 19.524 or equiv.

**19.526 Psychology of Aggression (2 q.h.)**

The role of aggressive and violent behavior in man and lower organisms. The contribution of both learned responses and genetic constitution. *Prereq.* 19.503 or equiv.

**19.527 Psychology of Conformity and Rebellion (2 q.h.)**

Psychological factors in conforming or rebellious behavior. Specific attention to psychological motives and attitudes of the individual with respect to decisions on political participation, drugs, sexual behavior, educational policy, and other current social problems. *Prereq.* 19.503 or equiv.

**19.528 Psychological Factors in National and International Conflict (2 q.h.)**

A review of the psychological images, dynamics, and decisions in national and international loyalty and hostility. *Prereq.* 19.503 or equiv.

**19.529 Interpersonal Behavior in the Small Group I (2 q.h.)**

Participation and observation of personalities and role behaviors in small group interaction. Each student will observe and analyze the behavior of both the himself and other group members. *Prereq.* 19.503 or equiv.

**19.530 Interpersonal Behavior in the Small Group II (2 q.h.)**

Continuation of 19.529. *Prereq.* 19.529 or equiv.

**19.532 Industrial Psychology I (2 q.h.)**

Psychology as applied to industry, including such topics as history causation of behavior, attitudes, morale, and supervision. *Prereq.* 19.503 or equiv.

**19.533 Industrial Psychology II (2 q.h.)**

The place of psychological tests in industry, individual differences, leadership, training, design of jobs and practical application of these topics for the student in industry. *Prereq.* 19.532 or equiv.

**19.534 Industrial Psychology III (2 q.h.)**

Topics studied this quarter include motivation, fatigue, safety, and job turnover as related to industry. Special emphasis given to industrial mental health, counseling, interviewing, and personnel selection. *Prereq.* 19.533 or equiv.

**19.535 Psychological Factors in the Creative Process (2 q.h.)**

Topics to be analyzed will include definitions of creativity, role of intelligence in creativity, motives for problem solving, creative personalities, the encouragement of creativity in the individual and groups, and computer duplication of creative behaviors. *Prereq.* 19.503 or equiv.

**19.536 Psychology of Thought (2 q.h.)**

Psychological factors in intuition, imagination, problem solving, information processing, and concept learning. *Prereq.* 19.503 or equiv.

**19.537 Psychology of Language (2 q.h.)**

The child's acquisition of language, verbal habits, the analysis and measurement of meaning, cultural determinants of linguistic behavior, communication processes, and recent research in psycholinguistics. *Prereq.* 19.503 or equiv.

**19.541 Abnormal Psychology I (2 q.h.)**

An introduction of the study of the etiology and dynamics of the abnormal personality. *Prereq.* 19.503 or equiv.

**19.542 Abnormal Psychology II (2 q.h.)**

The symptomatology and treatment of the neuroses and psychoses. *Prereq.* 19.541 or equiv.

**19.543 Abnormal Psychology III (2 q.h.)**

Psychosomatic, psychopathic, and organic disorders; varieties of psychotherapy. *Prereq.* 19.542 or equiv.

**19.546 Psychological Testing I (2 q.h.)**

Basic principles of test theory, test administration, and test construction. Familiarization with representative types of tests. *Prereq.* 19.506 or equiv.

**19.547 Psychological Testing II (2 q.h.)**

Continuation of 19.546. *Prereq.* 19.546 or equiv.

**19.551 Experimental Psychology I (2 Cl.; 2 Lab.; 3 q.h.)**

The methods and techniques for the design, execution, and interpretation of psychological experiments. *Prereq.* 19.506 or equiv.

**19.552 Experimental Psychology II (2 Cl.; 2 Lab.; 3 q.h.)**

Laboratory instrumentation and research methodology in the investigation of sensory and perceptual processes. *Prereq.* 19.551 or equiv.

**19.553 Experimental Psychology III (2 Cl.; 2 Lab.; 3 q.h.)**

Laboratory instrumentation and research methodology in the investigation of animal and human learning, motivation, and thought. *Prereq.* 19.552 or equiv.

**19.561 Historical Development of Psychology I (2 q.h.)**

The historical development of psychology from its philosophical beginnings. *Prereq.* two full-year courses in psychology.

**19.562 Historical Development of Psychology II (2 q.h.)**

Major schools of psychology which have influenced modern psychological research including functionalism, behaviorism, Gestalt psychology, and psychoanalysis. *Prereq.* 19.561 or *equiv.*

**19.563 Historical Development of Psychology III (2 q.h.)**

The role of theory in current psychological research. *Prereq.* 19.562 or *equiv.*

**19.571 Seminar in Psychology (2 q.h.)**

Discussion of current problems in psychology. *Prereq.* 19.553 or *equiv.*

**19.591 Honors Program I (4 q.h.)** *Prereq.* approval of the Dean.**19.592 Honors Program II (4 q.h.)**

*Prereq.* 19.591.

**19.593 Honors Program III (4 q.h.)**

*Prereq.* 19.592.

## 20—ANTHROPOLOGY

*Consultant:* (See Sociology)

**20.501 Introduction to Physical Anthropology (2 q.h.)**

An introduction to elements of physical anthropology, covering such subjects as the primates, fossil man and evolution, problems of heredity and genetics, and problems of race and racial classification.

**20.502 Cultural Anthropology I (2 q.h.)**

An intensive introduction to cultural anthropology covering the nature of culture; methods and theories. *Prereq.* 20.501 or *equiv.*

**20.503 Cultural Anthropology II (2 q.h.)**

Characteristic features of the language, family life, rituals, and values of tribal peoples in different parts of the world. *Prereq.* 20.502 or *equiv.*

**20.521 Culture and Personality (2 q.h.)**

A cultural approach integrating concepts of social role, values, personality and socialization, and linguistic considerations. *Prereq.* 20.503 or *equiv.*

**20.531 Primitive Social Organization (2 q.h.)**

The institutions of primitive societies; comparative approaches and functional explanations of a limited number of societies; the dynamics of continuity and change of culture and social organization. *Prereq.* 20.503 or *equiv.*

**20.532 Primitive Religion (2 q.h.)**

A study of religious beliefs and rituals of tribal peoples in many parts of the world, including the origin of religious behavior, the relationship of religious behavior to other aspects of culture, and the psychological factors involved. *Prereq.* 20.503 or *equiv.*

**20.533 Acculturation (2 q.h.)**

An examination of the processes of acculturation in culture contact situations of tribal and non-tribal peoples. Focus is on the role of the individual, and the concepts of personality and values in relation to this process. *Prereq.* 20.503 or equiv.

**20.537 Anthropological Theory (2 q.h.)**

A history of major orientations, emphasizing the principal contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure. *Prereq.* 20.503 or equiv.

**20.541 North American Indian (2 q.h.)**

Prehistory of the North American Indian, including the study of aboriginal culture areas, utilizing a comparative analysis of representative Indian tribes and their cultures as the method of study. Family life, religion, warfare patterns, and political organization are described. *Prereq.* 20.503 or equiv.

**20.544 African Peoples and Cultures (2 q.h.)**

African geography, prehistory and cultures; the spectrum of cultures ranging from the Pygmy to Ashanti Federation; the family, lineage, clan and tribe as these relate to problems of political and economic change in contemporary Africa. *Prereq.* 20.503 or equiv.

**20.547 Latin American Peoples and Cultures (2 q.h.)**

Tribal social systems, traditional values, and institutions of Latin America with particular emphasis on Hispanic America. *Prereq.* 20.503 or equiv.

**20.548 Studying the Family Cross Culturally (2 q.h.)**

The course will focus on the formation of differing family systems according to a variety of cultural settings. These will include: the Todas, the Hopi, the Anglo-Saxon, the Kibbutz, and the Baganda.

**20.549 Folklore (2 q.h.)**

The general nature of folklore and methods employed in its study with emphasis on the behavioral-structural approach.

## 21—SOCIOLOGY

*Consultant:* Prof. N. Kaplan, Chairman, Sociology-Anthropology Dept. (L.A. College)

**21.501 Sociology I (2 q.h.)**

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family.

**21.502 Sociology II (2 q.h.)**

A continuation of Sociology I with major emphasis on primary groups, associations, social stratification, collective behavior, and population. *Prereq.* 21.501 or equiv.

**21.503 Sociology III (2 q.h.)**

A continuation of Sociology II emphasizing a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *Prereq.* 21.502 or *equiv.*

**21.504 Sociology (Intensive) (6 q.h.)**

Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. Primary groups, associations, social stratification, collective behavior and population. The major institutional areas, with particular attention to problems of social, political, urban, and industrial change. Not open to students who have taken 21.501, 21.502, 21.503. *Prereq.* 30.506.

**21.512 Social Research Methods I (2 q.h.)**

An introduction to social research methods with particular attention to problems of theory and method. *Prereq.* 21.503 or *equiv.*

**21.513 Social Research Methods II (2 q.h.)**

A continuation of Social Research Methods I with emphasis on data collection, measurement, and scaling. *Prereq.* 21.512 or *equiv.*

**21.514 Social Research Methods III (2 q.h.)**

A continuation of Social Research Methods II stressing the analysis of data. *Prereq.* 21.513 or *equiv.*

**21.517 Foundations of Sociological Theory (2 q.h.)**

An historical survey of sociological theorists including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, and others. *Prereq.* 21.503 or *equiv.*

**21.518 Contemporary Sociological Theory I (2 q.h.)**

A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, as opposed to particular theorists, but material is drawn from theorists such as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons. *Prereq.* 21.517 or *equiv.*

**21.519 Contemporary Sociological Theory II (2 q.h.)**

A seminar in which the principal focus will be upon questions of theoretical interest, e.g., the problem of order, the problem of change, the role of the individual in change. Students will present their papers in class. *Prereq.* 21.518 or *equiv.*

**21.528 Social Stratification (2 q.h.)**

A comparative study of the nature of class structure with emphasis on the United States and with reference to India and England. Discussion of such topics as theories of class structure, factors determining class membership, differential class behavior, and social mobility. *Prereq.* 21.503 or *equiv.*

**21.531 Social Change (2 q.h.)**

An analysis of the changing patterns in social and economic institutions, a discussion of modern social trends, and a review of current literature in a field. *Prereq.* 21.503 or *equiv.*



**21.534 Social Control (2 q.h.)**

The study of group membership as a determinant of behavior, analysis of status and role, patterns of authority, and group ideology as factors in the evaluation of conduct. *Prereq. 21.503 or equiv.*

**21.535 Political Sociology (2 q.h.)**

The social structure of political life emphasizing relationships in the structure of society with its classes, occupations, races, and levels of opportunity as they affect political activity. *Prereq. 21.503 or equiv.*

**21.538 Introduction to Social Welfare I (2 q.h.)**

An introduction to the nature and scope of the social welfare institution, its historical development, the effects of urban industrialization, and relationship to present day American society.

**21.539 Introduction to Social Welfare II (2 q.h.)**

A continuation of Introduction to Social Welfare I with particular attention to the development of social security and the welfare state.

**21.540 Introduction to Social Welfare III (2 q.h.)**

A continuation of Introduction to Social Welfare II focusing on selected aspects of the current social welfare system, its attempts to alleviate poverty and other social problems.

**21.543 Introduction to Social Work Practice I (2 q.h.)**

An introduction to the functions of the helping profession of social work, its settings, and methods. Specific techniques such as interviewing, history taking, and recording skills are presented.

**21.544 Introduction to Social Work Practice II (2 q.h.)**

A continuation of Introduction to Social Work Practice I with particular attention to the functioning of social workers in selected settings.

**21.545 Introduction to Social Work Practice III (2 q.h.)**

A continuation of Introduction to Social Work Practice II with emphasis on enhancement of practice skills.

**21.546 Sociology of Deviant Behavior (2 q.h.)**

Analysis of the variety of social problems and their relationship to the organization of society. Particular attention will be given to alcoholism, sex offenses, drug abuse, mental health, and other problems relating to an urban industrial society. *Prereq. 21.503 or equiv.*

**21.547 Social Problems (2 q.h.)**

An overview of contemporary American social problems and the application of sociological concepts, methods, and principles to these problems. *Prereq. 21.503 or equiv.*

**21.548 Criminology I (2 q.h.)**

An introduction to the study of crime with particular attention to criminological theory. *Prereq. 21.503 or equiv.*



**21.549 Criminology II (2 q.h.)**

A continuation of Criminology I with emphasis on the causes of crime and relationship between law and crime. *Prereq. 21.548 or equiv.*

**21.550 Juvenile Delinquency (2 q.h.)**

A study of factors in delinquency and an examination of the implications for prevention, rehabilitation, and treatment. *Prereq. 21.503 or equiv.*

**21.551 Family and Marriage I (2 q.h.)**

A comparative and historical treatment stressing the past history and development of the family. *Prereq. 21.503 or equiv.*

**21.552 Family and Marriage II (2 q.h.)**

A continuation of Family and Marriage I emphasizing the backgrounds of contemporary problems in the context of functions, forms, and processes of this institution. *Prereq. 21.551 or equiv.*

**21.553 Racial and Cultural Relations I (2 q.h.)**

A study of the relationships between various racial, nationality, cultural, and religious groups with emphasis on the historical development of black-white relationships in American society. *Prereq. 21.503 or equiv.*

**21.554 Racial and Cultural Relations II (2 q.h.)**

A continuation of Racial and Cultural Relations I stressing the problems of contemporary black-white relationships in both American and other societies. *Prereq. 21.553 or equiv.*

**21.555 Racial and Cultural Relations III (2 q.h.)**

A continuation of Racial and Cultural Relations II with specific attention to religious nationality, and non-African racial groups in American and other multi-racial societies. *Prereq. 21.554 or equiv.*

**21.557 Urban Sociology (2 q.h.)**

An analysis of the various causes, characteristics, and effects of urbanization in several different cultures of the world. Specific attention is given to the problems of urban and suburban living and the changing structure of the city. *Prereq. 21.503 or equiv.*

**21.558 Community Analysis (2 q.h.)**

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of community study methods. Contrasts between rural communities and urban neighborhoods. Discussion and evaluation of community action programs. *Prereq. 21.503 or equiv.*

**21.560 Medical Sociology (2 q.h.)**

Sociological concepts and research relating to the study of patterns of behavior in the areas of health and disease. Emphasis on the family, community, medical organizations, class and status, as social subsystems related to the field of health. *Prereq. 21.503 or equiv.*

**21.563 Social Gerontology (2 q.h.)**

An examination of social factors involved in aging, with specific reference to how biological and psychological age change influence behavior, social roles, and cultural patterns. The relation of aging to social change, and special provisions for the aged. *Prereq.* 21.503 or equiv.

**21.567 Population (2 q.h.)**

The use of demographic methods in the analysis of social structures. Introduction to the use of population size and composition, birth rates, and other demographic data in the comparative analysis of societies. *Prereq.* 21.503 or equiv.

**21.570 Sociology of Occupations and Professions (2 q.h.)**

Analysis of the social relations within occupational groups, of occupational structure, and of institutional aspects of an occupation. Relationships of supervisors, peers, colleagues, subordinates, and clientele; their significance for work role behavior. *Prereq.* 21.503 or equiv.

**21.573 Sociology of Industry (2 q.h.)**

Comparison of pre-industrial and industrial society, stressing the impact of industry on society and the relationship between industry, culture, and values. Diversification and specialization. Human relations in industry; analysis of subordinate-super ordinate behavior, line and staff relationships, and of formal and informal groups. *Prereq.* 21.503 or equiv.

**21.575—Sociology of Formal Organizations (2 q.h.)**

A study of formal organizations and the principles that govern organizational life. Weber's theory of bureaucracy and the concept of authority; communication systems and other conceptions of formal organizations. The structure of work groups and their effect on the larger organization. *Prereq.* 21.503 or equiv.

**21.576 Seminar in Social Welfare (2 q.h.)**

An intensive study of specific issues in the social welfare field. The emphasis is oriented to the social policy aspects of selected problem areas such as poverty, income maintenance measures, health care, etc.

**21.591 Honors Program I (4 q.h.)**

*Prereq.* approval of Dean.

**21.592 Honors Program II (4 q.h.)**

*Prereq.* 21.591.

**21.593 Honors Program III (4 q.h.)**

*Prereq.* 21.592.

## 22—POLITICAL SCIENCE

*Consultant:* Prof. R. G. Wilfong, Chairman, Political Science Dept. (L.A. College)

**22.501 Principles of Political Science I (2 q.h.)**

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system.

**22.502 Principles of Political Science II (2 q.h.)**

Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. *Prereq.* 22.501 or equiv.

**22.503 Principles of Political Science III (2 q.h.)**

The American political system including study of civil rights. International politics and American foreign policy since 1945. *Prereq.* 22.502 or *equiv.*

**22.504 Introduction to Political Theory (2 q.h.)**

Development of the political ideas of the Western world. The major philosophers of Greece, Rome, the Christian Era, and the Renaissance. *Prereq.* 22.503 or *equiv.*

**22.505 Contemporary Political Theory (2 q.h.)**

Political ideas and systems of political thought from Machiavelli to the present. *Prereq.* 22.504 or *equiv.*

**22.506 American Political Thought (2 q.h.)**

Political thought from the colonial period to the present including a study of the impact of religious, economic, and judicial theory on the structure of American ideas. *Prereq.* 22.503 or *equiv.*

**22.507 Principles of Political Science (Intensive) (6 q.h.)**

Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system. Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. The American political system including study of Civil Rights. International politics and American foreign policy since 1945. Not open to students who have taken 22.501, 22.502, 22.503, or *equiv.*

**22.511 American National Government (2 q.h.)**

A study of the form and structure of the federal constitution and an analysis of the legislative process at the national level. *Prereq.* 22.503 or *equiv.*

**22.512 Urban and Metropolitan Government (2 q.h.)**

The political, structural, and functional problems of an urbanizing United States, including an analysis of urban, suburban, and metropolitan governments. *Prereq.* 22.503 or *equiv.*

**22.513 Political Parties and Pressure Groups (2 q.h.)**

Party government in the United States and Great Britain. A contrasting study focusing on the interaction of party and government. *Prereq.* 22.503 or *equiv.*

**22.514 American Constitutional Law (2 q.h.)**

A case analysis of the development of federalism, the separation of powers, and the role of the federal and state courts in constitutional development.

**22.515 Civil Rights (2 q.h.)**

An evaluation of the quality and content of civil liberties in the United States. Emphasis will be placed on the first, fifth, sixth, fourteenth, and fifteenth amendments to The Constitution.

**22.516 Public Administration I (2 q.h.)**

An introduction to the theory, forms and processes of administration at the national and state level.

**22.517 Public Administration II (2 q.h.)**

Selected problems. Case-study approach to examination of relation between the theory and practice of public administration. *Prereq.* 22.516 or equiv.

**22.518 Government and Politics of the States (2 q.h.)**

A study of state and local government and problems and the function and operational responses to them.

**22.519 The Legislative Process (2 q.h.)**

An institutional, functional analysis of the roles of Congress, the executive, and political parties in the legislative process.

**22.521 Comparative Government I (2 q.h.)**

A comparative analysis of the structure and functions of the governments of Great Britain and the USSR. *Prereq.* 22.503 or equiv.

**22.522 Comparative Government II (2 q.h.)**

A comparative analysis of the structure and functions of the governments of France and Western Germany. *Prereq.* 22.521 or equiv.

**22.523 Government and Politics of Latin America (2 q.h.)**

Political behavior, economic institutions, and social environment of selected Latin American states are examined against the background of the continuing influence of the United States in this region.

**22.524 Government and Politics of the Middle East (2 q.h.)**

A study of political change, economic growth, and social adaptation in selected countries of the Middle East. The role of the Middle East in world affairs, especially its ties with Northern Africa.

**22.525 Government and Politics of the Far East (2 q.h.)**

Governmental systems, economic institutions, and social environment of the states of East Asia (China, Japan, Korea, Taiwan) are studied with reference to the special influence of Communist China in this region.

**22.526 Government and Politics of Africa (2 q.h.)**

Government systems, political parties, socio-economic problems, and foreign policies are studied with reference to Africa's role in the international community.

**22.527 Communism in Eastern Europe (2 q.h.)**

The communist political systems of eastern Europe and their socio-economic environments are studied in respect to their relationship with USSR.

**22.531 International Relations (2 q.h.)**

Elements and limitations on national power. Contemporary world politics. Problems of war and peaceful coexistence. *Prereq.* 22.503 or equiv.

**22.532 International Organization (2 q.h.)**

Development of international organizations with special emphasis on the United Nations, specialized agencies, and regional organizations. *Prereq.* 22.503 or equiv.

**22.533 American Foreign Policy (2 q.h.)**

The constitution and political instruments for the formulation of American foreign policy. *Prereq.* 22.503 or *equiv.*

**22.534 Soviet Foreign Policy (2 q.h.)**

A study of the evolution of Soviet foreign policy since 1917 with emphasis on the development of the international communist movement.

**22.541 International Law (2 q.h.)**

A procedural and substantive study of legal relations among nation states.

**22.542 American Foreign Policy I (2 q.h.)**

Recent and current American foreign affairs. *Prereq.* 22.533 or *equiv.*

**22.543 American Foreign Policy II (2 q.h.)**

Recent and current American foreign affairs continued. *Prereq.* 22.542 or *equiv.*

**22.551 Current Political Issues (2 q.h.)**

A topical analysis of the constitutional and political basis of selected problems in American political life.

## 23—HISTORY

*Consultant:* Prof. R. Robinson, Chairman, History Dept. (L.A. College)

**23.501 Western Civilization I (2 q.h.)**

The beginnings of Western civilization with emphasis on the political, economic, and social history of the ancient and medieval world.

**23.502 Western Civilization II (2 q.h.)**

Modern Europe to 1815 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states.

**23.503 Western Civilization III (2 q.h.)**

Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.

**23.504 United States, 1783–1845 (2 q.h.)**

The United States from the close of the Revolution to the annexation of Texas, with primary attention to the political institutions and policies of the new Republic.

**23.505 United States, 1845–1900 (2 q.h.)**

The rise of sectional controversy in America, the Civil War, and the economic development of the nation after the war.

**23.506 United States since 1900 (2 q.h.)**

The United States in an age of urbanized industrialism and international crisis.

**23.521 Ancient Middle East (2 q.h.)**

A study of ancient cultures including Sumer, Babylonia, Egypt, and Israel.

**23.507 Western Civilization (Intensive) (6 q.h.)**

The beginnings of Western civilization with emphasis on the political, economic and social history of the ancient and medieval world. Modern Europe to 1815 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states, Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace. Not open to students who have taken 23.501, 23.502, 23.503.

**23.508 United States (Intensive) (6 q.h.)**

The United States from the close of the Revolution to the annexation of Texas, with primary attention to the political institutions and policies of the new Republic. The rise of sectional controversy in America, the Civil War, and the economic development of the nation after the war. The United States in an age of urbanized industrialism and international crisis. Not open to students who have taken 23.504, 23.505, 23.506.

**23.509 Western Civilization A (3 q.h.)**

Same as 23.501 plus the first half of 23.502.

**23.510 Western Civilization B (3 q.h.)**

Same as the second half of 23.502 plus 23.503.

**23.522 Ancient Greece (2 q.h.)**

The origins and development of Greek civilization, with special emphasis on the political evolution of Hellenistic society.

**23.523 Ancient Rome (2 q.h.)**

Roman civilization in ancient times, with special emphasis on the rise of the Republic and the decline of the Empire.

**23.524 Early Middle Ages (2 q.h.)**

Europe from the decline of the Roman Empire to 1215, with emphasis on the role of religion in medieval society and the fashioning of political and economic institutions of feudalism and manorialism.

**23.525 Late Middle Ages (2 q.h.)**

The medieval period from 1215 to 1500, with emphasis on the rebirth of classicism in literature and the arts.

**23.526 Early Modern Europe (2 q.h.)**

The political, economic, and social history of Europe from the dawn of the modern age to the Glorious Revolution.

**23.527 England, 500–1603 (2 q.h.)**

England to the coming of the Stuarts, with an account of political, religious, and social developments.

**23.537 European Intellectual History, 1350–1688**

The major ideas of the Renaissance and Reformation.

**23.538 European Intellectual History, 1688–1815**

The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas.

**23.539 European Intellectual History since 1815**

The main currents of European thought since Waterloo, considered in their social and political context.

**23.541 Europe, 1688–1789 (2 q.h.)**

Europe from the Glorious Revolution to the French Revolution, with emphasis on the impact of the Enlightenment.

**23.542 Europe, 1789–1870 (2 q.h.)**

Europe from the French Revolution to the Franco-Prussian War, with a stress on the struggles for liberalism and nationalism.

**23.543 Europe, 1870–1914 (2 q.h.)**

The background of World War I with an emphasis on the roles of nationalism, militarism, imperialism, and the European alliance system.

**23.544 Europe, 1914–1939 (2 q.h.)**

Europe from World War I to World War II, emphasizing the failures of peace-makers at Versailles and the subsequent rise of aggressive autocracies in Italy and Germany.

**23.545 Europe since 1939 (2 q.h.)**

World War II and its aftermath, with emphasis on the Cold War and attempts by European nations to unify the continent.

**23.548 England, 1603–1815 (2 q.h.)**

England in the Stuart and Hanover age, with emphasis on the victory of parliamentary institutions over the monarchy.

**23.549 England since 1815 (2 q.h.)**

The democratization of English life in the nineteenth and twentieth centuries, with emphasis on changing imperial and international relations.

**23.552 English Constitutional History to 1485 (2 q.h.)**

The development of the English constitution from Anglo-Saxon roots to the coming of the Tudors, with emphasis on local as well as central government.

**23.553 English Constitutional History since 1485 (2 q.h.)**

The victory of Parliament over the King and the subsequent democratization of England's governmental institutions and processes.

**23.554 France since 1815 (2 q.h.)**

France after Napoleon, emphasizing the continuing attempt by the French people to find satisfactory political institutions.

**23.555 Germany since 1815 (2 q.h.)**

An analysis of the role of nationalism in German life after 1815, with emphasis on unification, militarism, and imperialism.



**23.556 Italy since 1815 (2 q.h.)**

The unification of Italy, the attempt to establish constitutional monarchy, the rise of facism after World War I, and the movement toward democratic republicanism after World War II.

**23.557 Ireland since 1800 (2 q.h.)**

A study of the Irish question in British politics from the Act of Union to the establishment of the Free State, with special emphasis on Ireland as an underdeveloped country.

**23.561 Colonial America to 1689 (2 q.h.)**

The exploration and settlement of North America, with emphasis on the establishment of political, social, and economic institutions.

**23.562 Colonial America, 1689–1763 (2 q.h.)**

North America in an age of international rivalry for the continent.

**23.563 American Revolution and Constitution (2 q.h.)**

America's quest for independence from England and the efforts to establish governments in the new republic.

**23.564 Topics in American Constitutional History to 1900 (2 q.h.)**

Selected topics in the development of The American Constitution during the nineteenth century, with primary emphasis on federalism and the relations of governments and the economy.

**23.565 Topics in Twentieth-Century American Constitutional History (2 q.h.)**

Topics include the conflict between the liberal and conservative attitudes toward the role of government in the economy and the role of the Supreme Court in the struggle for civil liberties and rights.

**23.566 United States since 1933 (2 q.h.)**

American society in a period of depression, war, and postwar crisis at home and abroad.

**23.567 Topics in American Diplomatic History (2 q.h.)**

Selected topics in the history of American foreign policy from 1789 to the present.

**23.568 Topics in American Social History (2 q.h.)**

Selected topics in the history of the American people since 1789.

**23.569 Topics in American Economic History (2 q.h.)**

Selected topics in the development of the capitalist economy in America since 1789, with emphasis on the role of government.

**23.571 American Urban History (2 q.h.)**

The development of urban society in the United States since 1800.



**23.574 Afro-American History (2 q.h.)**

The history of the Afro-American from colonial times to the present.

**23.581 Latin America to 1826 (2 q.h.)**

The fusing of Indian, Iberian, and Negro cultures in Latin America, and the quest for political independence.

**23.582 Latin America, 1826–1920 (2 q.h.)**

The attempts by Latin Americans to establish democratic, stable societies, and the foreign relations of Latin American nations, especially with the United States.

**23.583 Contemporary Latin America (2 q.h.)**

The struggles of Latin Americans for political, economic, and social development since 1920.

**23.584 The Far East before 1850 (2 q.h.)**

The history of China, Japan and other Asiatic places prior to their opening by the West in the mid-nineteenth century.

**23.585 China since 1850 (2 q.h.)**

A century of China's history with emphasis on the Western impact on Chinese civilization, China's struggle to maintain independence, and the victory of communism in the twentieth century.

**23.586 Japan since 1850 (2 q.h.)**

An analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century, with emphasis on the Japanese quest for territory and power, World War II, and the post-war epoch.

**23.588 Africa North of Sahara (2 q.h.)**

North Africa to the present, with primary emphasis on the European impact on the area, and the subsequent movement for political independence and economic development.

**23.589 Africa South of Sahara (2 q.h.)**

A companion to course 23.588, with primary emphasis on the rise and decline of imperialism in the area.

**23.591 Modern Middle East (2 q.h.)**

The Middle East since 1914, emphasizing Zionism, Pan Arabism, the effects of two world wars, and the post-war settlements.

**23.592 India and Pakistan (2 q.h.)**

The political and religious history of the people who formed India and Pakistan, with an account of internal developments and foreign relations since independence.

**23.593 Southeast Asia (2 q.h.)**

The cultures of the peoples of Southeast Asia, with an examination of the impact of European nations upon them and an account of their quest for national identity and economic development.

**23.594 Russia, 1450–1801 (2 q.h.)**

The emergence of Russia as a recognized European power, with an account of westernization and expansion in the eighteenth century.

**23.595 Russia, 1801–1917 (2 q.h.)**

The history of the Russian people and their government from the days of Czar Alexander I to the revolutions of 1917.

**23.596 Russia since 1917 (2 q.h.)**

The revolutions of 1917 and the subsequent history of the Russian people and their government, with special emphasis on foreign relations.

**23.597 Honors Program I (4 q.h.)**

*Prereq.* approval of Dean.

**23.598 Honors Program II (4 q.h.)**

*Prereq.* 23.597.

**23.599 Honors Program III (4 q.h.)**

*Prereq.* 23.598.

## 26—PHILOSOPHY

*Consultant:* Prof. W. L. Fogg, Chairman, Philosophy Dept. (L.A. College)

**26.501 Introduction to Philosophy I (2 q.h.)**

An examination of the aims, functions, and methods of philosophy by means of a systematic study of one or two philosophers. Questions in ethics and moral philosophy stressed in the latter part of the quarter.

**26.502 Introduction to Philosophy II (2 q.h.)**

Development of some of the major conceptions of the meaning of human existence, the nature of human knowledge, and the nature and existence of God.

**26.503 Introduction to Philosophy III (2 q.h.)**

A study of some of the central views of the aims, structure, and functions of society. One other area in philosophy will be discussed in the latter half of this quarter.

**26.510 Introduction to Philosophy (Intensive) (6 q.h.)**

An examination of the aims, functions, and methods of philosophy in comparison with other areas of human knowledge and valuation. Inquiry into the nature of morality, kinds of moral judgments, and types of ethical theories with particular attention to their application to moral issues of our day. Comparison of major conceptions of the ultimate meaning of human existence, the nature of mind, freedom, and God. Not open to students who have taken 26.501, 26.502, 26.503, or equiv.

**26.504 The Greek and Roman Philosophers (2 q.h.)**

Development of western thought from the seventh century B.C. until the time of Christ with emphasis upon Plato, Aristotle, and the Stoics.

**26.505 The Ages of Belief and Adventure (2 q.h.)**

The leading philosophers of the early Christian, Medieval, and Renaissance periods with particular attention to St. Augustine, St. Thomas, Francis Bacon, and Thomas Hobbes. *Prereq.* 26.504 or *equiv.*

**26.506 The Ages of Reason and Enlightenment (2 q.h.)**

Philosophy in the seventeenth and eighteenth centuries with emphasis upon Descartes, Spinoza, Locke, Hume, and Kant. *Prereq.* 26.505 or *equiv.*

**26.507 Philosophy of the Nineteenth Century (2 q.h.)**

Philosophic trends in the nineteenth century considered as background for the understanding of ideas influential in the twentieth century. *Prereq.* 26.503, 26.506 or *equiv.*

**26.508 Twentieth Century Philosophy (2 q.h.)**

Discussion of the major contemporary philosophic trends as represented by logical positivism, analytic philosophy, and existentialism. *Prereq.* 26.057 or *equiv.*

**26.509 Major Thinkers of our Time (2 q.h.)**

An in-depth study of two or three philosophers, representative of which would be Austin, Ayer, Carnap, Dewey, Lewis, Maritain, Moore, Sartre, or Whitehead. *Prereq.* 26.508 or *equiv.*

**26.511 Philosophy of Art I (2 q.h.)**

The nature of art and the experience of beauty.

**26.512 Philosophy of Art II (2 q.h.)**

Theories concerning art and aesthetic experience such as those of Plato, Aristotle, Tolstoy, Santayana, Dewey, and Cassirer. *Prereq.* 26.511 or *equiv.*

**26.513 Philosophy of Art III (2 q.h.)**

A study of the problems of artistic taste, standards of criticism, and the objectivity of artistic judgments. Concludes with a discussion of the arts, the artist, and society. *Prereq.* 26.512 or *equiv.*

**26.521 Philosophy of Religion I (2 q.h.)**

A study of the nature of religious experience and beliefs about the nature of God.

**26.522 Philosophy of Religion II (2 q.h.)**

The origins, nature, and functions of religion. *Prereq.* 26.521 or *equiv.*

**26.523 Philosophy of Religion III (2 q.h.)**

Intensive study of some of the major problems such as natural and moral evil, the soul, immortality, miracles, and religious knowledge. *Prereq.* 26.522 or *equiv.*

**26.524 The Great Eastern Religions I (2 q.h.)**

The development of eastern primitive religions and their subsequent evolution into the sophisticated forms of the contemporary eastern religions.

**26.525 The Great Eastern Religions II (2 q.h.)**

Study of Egyptian and Babylonian religions, Confucianism, and Taoism. *Prereq.* 26.524 or equiv.

**26.526 The Great Eastern Religions III (2 q.h.)**

Study of Hinduism, Buddhism, and Shintoism. *Prereq.* 26.525 or equiv.

**26.527 The Great Western Religions I (2 q.h.)**

The development of western primitive religions and their subsequent evolution into the sophisticated forms of the contemporary western religions.

**26.528 The Great Western Religions II (2 q.h.)**

Study of Zoroastrianism, Judaism, and Christianity. *Prereq.* 26.527 or equiv.

**26.529 The Great Western Religions III (2 q.h.)**

Study of the religion of Islam, contemporary religious sects, and religious phenomena. *Prereq.* 26.528 or equiv.

**26.531 Ethics I (2 q.h.)**

Introduction to moral problems such as egoism and altruism, good and evil, conscience, obligation, and human freedom.

**26.532 Ethics II (2 q.h.)**

Critical discussion of some of the major ethical theories and the implications of modern psychological and sociological theories about man and society. *Prereq.* 26.531 or equiv.

**26.533 Ethics III (2 q.h.)**

The relations of ethical theory and morality to religion, social philosophy, art, and science. *Prereq.* 26.532 or equiv.

**26.534 Logic (2 q.h.)**

Emphasis upon logic as a practical discipline which enables the student to analyze types of argument and to detect fallacies in argument.

**26.541 Social Philosophy I (2 q.h.)**

Critical examination of the leading socio-political ideologies in regard to their conceptions of the character, structure, and function of society. Plato and Aristotle emphasized.

**26.542 Social Philosophy II (2 q.h.)**

Continuation of 26.541 with emphasis upon Hobbes, Locke, Hegel, and Mill. *Prereq.* 26.541 or equiv.

**26.543 Social Philosophy III (2 q.h.)**

Emphasis upon Marxism, contemporary communism, fascism, capitalism, and contemporary social ideologies. *Prereq.* 26.542 or equiv.

**26.551 The Existentialist Revolt (2 q.h.)**

Sources of existentialism in the Western tradition with emphasis upon Kierkegaard and Nietzsche.

**26.552 The Existentialist Challenge (2 q.h.)**

The existential view of man and his world with emphasis upon Heidegger, Sartre, and the religious existentialists—Marcel, Tillich, and Buber. *Prereq.* 26.551 or equiv.

**26.553 Existentialism Appraised (2 q.h.)**

Contemporary assessments of the existentialism movement, its meaning, significance, and truth. *Prereq.* 26.552 or equiv.

## 27—FINE ARTS

*Consultant:* Prof. R. L. Wells, Chairman, Art Dept. (L.A. College)

**27.501 Introduction to the Arts (2 q.h.)**

Introduction to the techniques and meanings of various artistic expressions in painting, sculpture, drawing, architecture and graphic arts.

**27.504 History of Art I (2 q.h.)**

History of Western art from prehistoric times to the end of the Roman Empire.

**27.505 History of Art II (2 q.h.)**

History of Western art from the end of the Roman Empire to the late sixteenth century. *Prereq.* 27.504.

**27.506 History of Art III (2 q.h.)**

History of Western Art from the late sixteenth century to the twentieth century. *Prereq.* 27.505.

**27.507 Ancient Architecture (2 q.h.)**

Developments in the builder's art from prehistoric times to the end of the Classical Era.

**27.508 Medieval and Renaissance Architecture (2 q.h.)**

A study of architecture from the Early Christian Period through the Renaissance.

**27.509 European Architecture (2 q.h.)**

Seventeenth- eighteenth- and nineteenth-century architecture.

**27.510 Ancient Painting and Sculpture I (2 q.h.)**

A survey of art from pre-historic period through Egypt and Mesopotamia.

**27.511 Ancient Painting and Sculpture II (2 q.h.)**

A survey of art from Crete through Greece and Rome.

**27.512 Medieval Painting and Sculpture (2 q.h.)**

Early Christian art; Byzantine, Romanesque, and Gothic art.

**27.513 Italian Renaissance Painting (2 q.h.)**

A study of Italian painting of the fifteenth and sixteenth century.

**27.514 European Painting (2 q.h.)**

Development of painting from the late sixteenth century to the middle of the nineteenth century in Northern and Western Europe.

**27.515 Modern Painting I (2 q.h.)**

The development of painting from late nineteenth century through the Cubist movement.

**27.516 Modern Painting II (2 q.h.)**

The development of painting from the surrealist movement to abstract expressionism.

**27.517 Modern Painting III (2 q.h.)**

A study of contemporary trends in painting in the United States and Europe.

**27.518 Twentieth-Century American Architecture (2 q.h.)**

Study of architecture from Richardson to the present.

**27.519 Twentieth-Century European Architecture (2 q.h.)**

Study of architecture from Le Corbusier to the present.

**27.521 Spanish Art (2 q.h.)**

Spanish art and painting from the Gothic to the nineteenth century.

**27.522 French Art (2 q.h.)**

Study of French painting, sculpture, and architecture to the nineteenth century.

**27.523 English Art (2 q.h.)**

English art from the Gothic to the nineteenth century.

**27.524 American Art I (2 q.h.)**

The development of American architecture, sculpture, and painting from Colonial times to the War of Independence.

**27.525 American Art II (2 q.h.)**

The development of American architecture, sculpture and painting from the Revolution to the Civil War. *Prereq.* 27.524 or equiv.

**27.526 American Art III (2 q.h.)**

The development of American architecture, sculpture and painting from the Civil War to the present. *Prereq.* 27.525 or equiv.

**27.531 Oriental Art I (2 q.h.)**

The prehistoric arts of Asia; the Chinese ritual bronzes; and international Buddhist painting, sculpture, and architecture.

**27.532 Oriental Art II (2 q.h.)**

The national Indian styles of sculpture and architecture, and traditional Chinese painting. *Prereq.* 27.531 or equiv.

**27.533 Oriental Art III (2 q.h.)**

The Chinese art of pottery and the painting, sculpture and architecture of Japan and Korea. *Prereq.* 27.532 or *equiv.*

**27.534 Russian Art (2 q.h.)**

A survey of Russian art from ancient Russia to the present.

**27.535 African Art (2 q.h.)**

Various stylistic characteristics of sculpture and other artistic expressions of the major cultures of Africa from the thirteenth to the twentieth century.

**27.536 Latin American Art (2 q.h.)**

Pre-Columbian and post-Columbian art forms of Latin America, including architecture, sculpture, painting, and the decorative arts.

**27.537 Buddhist Art (2 q.h.)**

Course traces the origins of Buddhist art forms in sculpture, architecture, and painting and their subsequent evolution into an international style.

**27.538 Chinese Painting (2 q.h.)**

A history of the Chinese art of painting from its inception up to the twentieth century.

**27.539 Japanese Art (2 q.h.)**

The arts of painting, sculpture, and architecture in Japan.

**27.540 Free-hand Drawing (3 q.h.)**

An elementary course in drawing. (Does not fulfill the drawing requirement for the studio art major.)

**27.541 Drawing I (3 q.h.)**

Practice in the techniques and development of drawing in pencil and pen and ink, with concentration on basic drawing problems.

**27.542 Drawing II (3 q.h.)**

Practice in the techniques of wash drawing, scratch board drawing, and mixed medias. *Prereq.* 27.541 or *equiv.*

**27.543 Drawing III (3 q.h.)**

Study of human anatomy and the practice of figure drawing and composition. *Prereq.* 27.542 or *equiv.*

**27.544 Graphic Arts I (3 q.h.)**

Creative expression in various graphic art medias such as woodcuts.

**27.545 Graphic Arts II (3 q.h.)**

Execution of prints in various medias and the printing process.

**27.546 Graphic Arts III (3 q.h.)**

Execution of more advanced print making with various graphic media.

**27.547 European Graphic Arts (2 q.h.)**

History of graphic arts from the Medieval period to the end of the nineteenth century. Development of engraving, etching, woodcuts, and lithography.



**27.551 Painting—Basic Level I (3 q.h.)**

Practice and creative expression in the technical fundamentals of figure and landscape painting.

**27.552 Painting—Basic Level II (3 q.h.)**

Creative expression in advance painting problems of figure study. *Prereq.* 27.551 or equiv.

**27.553 Painting—Basic Level III (3 q.h.)**

Creative expression in advanced painting problems in composition. *Prereq.* 27.552 or equiv.

**27.554 Painting—Advanced Level I (3 q.h.)**

Painting with concentration upon the development of personal expression and style.

**27.555 Painting—Advanced Level II (3 q.h.)**

Painting with concentration upon the development of personal style and the execution of various painting problems.

**27.556 Painting—Advanced Level III (3 q.h.)**

Development of style and experimentation with various medias.

**27.561 Basic Color and Design I (3 q.h.)**

Study and practice of the principles of design and science of color.

**27.562 Basic Color and Design II (3 q.h.)**

Advanced study in science of color. *Prereq.* 27.561 or equiv.

**27.563 Basic Color and Design III (3 q.h.)**

Advanced problems in design. *Prereq.* 27.562 or equiv.

**27.564 Advanced Color and Design (3 q.h.)**

Creative expression in various color and design problems.

**27.571 Basic Commercial Design I (3 q.h.)**

Study and creative work in layout, illustration, advertising and typography.

**27.572 Basic Commercial Design II (3 q.h.)**

Advanced commercial design problems. *Prereq.* 27.571 or equiv.

**27.573 Basic Commercial Design III (3 q.h.)**

Advanced commercial design problems. *Prereq.* 27.572 or equiv.

**27.574 Advanced Commercial Design (3 q.h.)**

Creative problems in illustration design.

**27.577 Stained Glass Design I (3 q.h.)**

History of the art and craft of stained glass.



**27.578 Stained Glass Design II (3 q.h.)**

Stained glass execution with creative problems. *Prereq.* 27.577 or *equiv.*

**27.579 Stained Glass Design III (3 q.h.)**

Advanced stained glass execution with creative problems. *Prereq.* 27.578 or *equiv.*

**27.587 History of Photography I (2 q.h.)**

Early developments in photography from ancient times to the daguerreotype.

**27.588 History of Photography II (2 q.h.)**

Developments of modern photography from the work of Stieglitz to the present. *Prereq.* 27.587 or *equiv.*

**27.589 History of Photography III (2 q.h.)**

Study of styles in contemporary photography with emphasis on major modern photographs. *Prereq.* 27.588 or *equiv.*

**27.591 Art Seminar (2 q.h.)**

Specific techniques, problems, and theories in art. Students will be responsible for research projects and papers.

**27.542 New York Art Seminar (2 q.h.)**

Study and inspection of the painting collections in the Metropolitan Museum of Art, Frick Collection, Museum of Modern Art, and the Guggenheim Museum.

**27.594 European Art Seminar (2 q.h.)**

A four-week study and travel seminar through major European art centers, with emphasis on the major arts in each art center.

**27.597 History and Technique of Film Art I (2 q.h.)**

A study of the development of film art in Europe and America from its origins to 1945.

**27.598 History and Technique of Film Art II (2 q.h.)**

A study of the development of film art in the United States and Europe from 1945 to the present. *Prereq.* 27.597.

**27.599 History and Techniques of Film Art III (2 q.h.)**

Study of films by major contemporary directors. *Prereq.* 27.598.

## 28—MUSIC

*Consultant:* Prof. R. L. Nadeau, Chairman, Music Dept. (L.A. College)

**28.501 Introduction to Music (2 q.h.)**

The principal concern is to teach the student a technique for listening actively to music. The course surveys and analyzes works by J. S. Bach, Mozart, Beethoven, Wagner, Stravinsky, and others.

**28.511 History of Music (2 q.h.)**

The men, ideas, and events that have dominated music history from ancient times through the Renaissance, Baroque, Classical, and Romantic eras to our own day.

**28.512 Music before 1750 (2 q.h.)**

The evolution of music from the Gregorian chant to Bach. Discussion of organum, the church modes, the music of the troubadours, the motets and madrigals of des Prez, Lassus, and Palestrina, as well as the English madrigalists, concluding with Handel, Scarlatti, and Bach.

**28.513 Music of the Classical Era (2 q.h.)**

A study of the period in music history extending from Bach to Beethoven characterized by the perfection of great forms such as the symphony and the concerto.

**28.514 Aspects of Romantic Music (2 q.h.)**

Musical styles of the nineteenth century. Classicism and Romanticism. A detailed study of romantic realism (program music) and romantic idealism (personal expression) that followed Beethoven.

**28.515 Contemporary Music (2 q.h.)**

Contemporary music and its techniques seen as a mirror of our time. Major composers studied include Stravinsky, Debussy, Ravel, Bartok, Prokofiev, Hindemith, Milhaud, and Schoenberg.

**28.520 Musical Forms (2 q.h.)**

The fugue, the sonata, theme and variations, rondo, the lied; analysis of the symphony, the string quartet, the opera, and the tone poem.

**28.521 The Symphony (2 q.h.)**

A thorough study of the symphonies of Haydn, Mozart, Beethoven, Berlioz, Brahms, Dvorak, and Tchaikovsky.

**28.522 The Concerto (2 q.h.)**

The evolution of the concerto from its origins in the Baroque period to its use in our time. Concertos for every instrument are studied, including piano, cello, violin, horn, organ, and bassoon.

**28.523 Great Literature for the Piano (2 q.h.)**

The study of pianoforte music written in the nineteenth and early twentieth centuries by masters such as Beethoven, Chopin, Schumann, Liszt, Debussy, and Ravel.

**28.524 The World of Opera (2 q.h.)**

Distinctions will be made between music drama and the number opera. Students will be required to acquire librettos. Aria, recitative, ensemble, and other basic elements of opera will be isolated and discussed.

**28.526 Jazz: Evolution and Essence (2 q.h.)**

The many roots of jazz and its development from the worksong and the vocal blues to the avant-garde experiments of today. Contributions of the major performers: soloists, arrangers, composers. The problems of "on-the-spot" creativity and personal expression. The "beat." Multiplicity of accent.

**28.531 Life and Works of J. S. Bach (2 q.h.)**

A comprehensive survey of the music and background of J. S. Bach with four areas of concentration: Bach and the figured bass; the young Bach (Baroque Romanticism); Bach, the churchman; Bach, the secular composer.

**28.532 Life and Works of Mozart (2 q.h.)**

Mozart's mastery in all fields of music with particular emphasis on his development of the symphony and his achievements in opera. The man, as seen through his letters, as performer and composer.

**28.533 Life and Works of Beethoven (2 q.h.)**

An analysis of the complex personality and art of this supreme musical genius. His relation to the turbulent times in which he lived; his role as the great transition figure in the passage from classicism to romanticism. His psychological and aesthetic growth will be observed by studying similar forms written in different periods of his life.

**28.540 The Black Artist in Music (2 q.h.)**

General survey of Afro-American music in the U.S. traced from its origins in Africa to the present. Emphasis on jazz, its history and an analysis of the contributions of major innovative figures. Sources and origins of jazz, as well as their contemporary extensions will be studied. Intended to introduce the student to the vast and rich expanses of black musical culture, both from a musical and socio-historical standpoint.

**28.541 Nationalism in Music (2 q.h.)**

The relationship of folk song, dance, and art to symphonic literature; nationalistic elements in the music of Dvorak, Tchaikovsky, Grieg, Copland, Shostakovich, Sibelius; the effect of ideology on composers; the Soviet composers.

**28.542 Music of the U. S. A. (2 q.h.)**

American music from the colonial times to the present, influence of Stravinsky and Schoenberg on American composers, music for the theater, jazz, electronic music, and contemporary musical trends.

**28.569 London Music Seminar (2 q.h.)**

Examination of the contemporary London music scene by viewing and evaluating representative productions.

**28.571 Piano Class I (2 q.h.)**

Fundamentals of music and interval identification. Scales and arpeggios, hands separate. Ear training through keyboard harmony and some emphasis on ensemble playing. Repertoire requirements; early Mozart minuets, etc.

**28.572 Piano Class II (2 q.h.)**

Scales and arpeggios, hands together. Primary triads in some major and minor keys for improvisation and ear playing. Sight playing and some duet performances. Repertoire: Anna Magdalena. Notebook by J. S. Bach.

**28.573 Piano Class III (2 q.h.)**

Scales and arpeggios, hands together (2 octaves). Primary triads in all keys adding secondary triads in some keys. Transposition of simple tunes, including The National Anthem, using own accompaniment in all keys. Sight playing, Diller—Quaille Book II, Repertoire: *Complete Oxford Piano Course*.

**28.574 Orchestral Instrument Class I (2 q.h.)**

Basic problems involved in the performance of chamber music literature; intonation, rhythm, balance, and style.

**28.575 Orchestral Instrument Class II (2 q.h.)**

Advanced study of chamber music literature; emphasis on historical investigation and stylistic analysis.

**28.576 Orchestral Instrument Class III (2 q.h.)**

Performance and critical discussion of chamber music literature from all periods, culminating in an informal concert for invited guests and friends.

**28.577 Voice Culture I (2 q.h.)**

Blending with other voices. Elementary music reading. Singing at choral literature. Activity and performance with N.U. Chorus.

**28.578 Voice Culture II (2 q.h.)**

Intermediate reading skills. Conducting. Smaller choral ensemble literature. Activity and performance with N.U. Chorus. *Prereq.* 28.577 or equiv.

**28.579 Voice Culture III (2 q.h.)**

Survey of Choral Literature. Activity and performance with N.U. Chamber Group and Chorus. *Prereq.* 28.578 or equiv.

**28.590 Directed Study (2 q.h.)**

Independent work under the direction of the department upon a chosen topic. Limited to qualified students with approval of department chairman. *Prereq.* Dept. approval.

**28.595 Opera Seminar (2 q.h.)**

An historical survey of opera. Students will attend performances of several operas and write critical reviews.

**28.596 Tanglewood Seminar (2 q.h.)**

A study of Tanglewood as a performing and educational center. Students will attend and discuss performances by the Boston Symphony Orchestra at Tanglewood and write critical reviews.

**28.597 Symphony Seminar (2 q.h.)**

An historical survey and analytic study of the symphony orchestra. Students will attend performances of several different symphony orchestras and write critical reviews.

**28.598 Musical Comedy Seminar (2 q.h.)**

An historical survey and analytic study of musical shows. Students will attend performances and write critical reviews.

**28.599 Theory I—Tonal Techniques A (2 q.h.)**

Fundamentals. Pitch and rhythmic notation, scales, intervals, chord construction. Basic ear training; melodic and rhythmic dictation.

**28.600 Theory II—Tonal Techniques B (2 q.h.)**

Chord progression. Realization of figured bass, voice leading, harmonic rhythm. Non-harmonic tones. Melodic and rhythmic dictation. *Prereq.* 28.599 or equiv. or consent of instructor prior to registration.

**28.601 Theory III—Eighteenth-Century Harmonic Practice (2 q.h.)**

Choral analysis. Seventh chords, secondary dominants, modulation. Melodic and rhythmic dictation. *Prereq.* 28.600 or equiv. or consent of instructor prior to registration.

**28.602 Music History I (2 q.h.)**

The development of monody and of polyphonic music from its beginning to about 1600; developments in musical style from Monteverdi to Corelli.

**28.603 Music History II (2 q.h.)**

Developments in musical style from Handel, Bach, and Vivaldi to Mozart, Haydn, and early Beethoven. *Prereq.* 28.603 or equiv. or consent of instructor prior to registration.

**28.604 Music History III (2 q.h.)**

Developments in musical style from Beethoven to Brahms. *Prereq.* 28.602 or equiv. or consent of instructor prior to registration.

**28.605 Theory IV (2 q.h.)**

Non-dominant seventh's; ninth, eleventh, and thirteenth chords. Linear embellishment of harmony and harmonization of melody. Keyboard harmony. Melodic and rhythmic dictation; part singing. *Prereq.* 28.601 or equiv. or consent of instructor prior to registration.

**28.606 Theory V (2 q.h.)**

Analysis of appropriate period forms and compositions. Chromatic and other non-diatonic harmony. Advanced modulation. Keyboard harmony. Melodic-rhythmic dictation and part singing. *Prereq.* 28.605 or equiv. or consent of instructor prior to registration.

**28.607 Theory VI (2 q.h.)**

Continuing analysis of compositions and period forms. Modern chord symbols. Basic principles of serial writing. Keyboard harmony. Melodic-rhythmic dictation and part singing. *Prereq.* 28.606 or equiv. or consent of instructor prior to registration.

**28.608 Contrapuntal Technique I (2 q.h.)**

A study of sixteenth-century counterpoint.

**28.609 Contrapuntal Techniques II (2 q.h.)**

A study of seventeenth- and eighteenth-century counterpoint. *Prereq.* 28.608 or equiv. or consent of instructor prior to registration.

## 29—SPEECH AND THEATRE ARTS

Consultant: Prof. E. J. Blackman, Chairman, Drama and Speech Dept. (L.A. College)

**29.501 Effective Speaking I (2 q.h.)**

Selection and organization of speech materials, essentials of good platform delivery, individual and class criticism of both prepared and impromptu speeches. A practical course devoted to developing an ability to speak easily, naturally and forcefully.

**29.502 Effective Speaking II (2 q.h.)**

This course builds upon the techniques and principles developed in Effective Speaking I by stressing increased student proficiency. Speech organization and delivery of more complex materials with which the student is likely to be confronted in business, industry, or the professions will be studied. *Prereq.* 29.501.

**29.503 Effective Speaking III (2 q.h.)**

The individual speaker as part of a group. The role of discussion in problem analysis, problem solving, and policy making. The principles and methods of organizing and participating in group discussions. Parliamentary procedure.

**29.504 Voice and Articulation I (2 q.h.)**

A practical course aimed at developing the speaking voice; special emphasis on articulation, pitch control, vocal variety, and flexibility; basic theory of the vocal mechanism.

**29.505 Voice and Articulation II (2 q.h.)**

Study of the science of speech sounds, investigation of regionalisms, individual voice development. *Prereq.* 29.504.

**29.506 Oral Interpretation (2 q.h.)**

Application of basic vocal techniques to the dramatic interpretation of various forms of literature.

**29.507 Business and Professional Speaking (2 q.h.)**

Practice in the organization and presentation of material to fit varying audiences. Emphasis on techniques of delivery and effective presentation of ideas.

**29.508 Argumentation and Discussion (2 q.h.)**

Designed to acquaint the student with the basic concepts of argumentation (evidence, research, refutation). Emphasis is placed on the psychology of an audience and various types of group discussion.

**29.509 Parliamentary Procedure (2 q.h.)**

Methods of conducting and organizing meetings. Development of effective leadership techniques. Experience in chairing a meeting and applying rules of order.

**29.511 Introduction to Theatre Arts (2 q.h.)**

A course aimed at developing in theatregoers an appreciation of the total theatre experience, by studying the roles played by the artists and craftsmen of the theatre in bringing the playwright's script to life. The role of the director, actors, and designers. The role of the audience as critics.

**29.521 Introduction to Dramatic Literature (2 q.h.)**

The relationship between drama as literature and as theatre. Types of drama: comedy, tragedy, melodrama, farce, and drawing-room comedy. The dramatist's attitude and his style: Classicism, Romanticism, Realism, Naturalism, and Theatricalism.

**29.522 Masters of the Theatre I (2 q.h.)**

The plays in relationship to their times, the theatres in which they were performed, and the dramatic theory of the age. An examination of selected plays from the Classical Greek and Roman, Medieval Religious and Secular, and Elizabethan theatre.

**29.523 Masters of the Theatre II (2 q.h.)**

The art of the Italian commedia dell'arte, the Neoclassic theatre of Racine, Moliere, and Dryden, the Restoration theatre, and the plays of Goldsmith and Sheridan.



**29.524 Modern European Drama (2 q.h.)**

An examination of European drama of the late nineteenth century and of the twentieth century reflecting the changing views toward the nature of man and the techniques of theatre.

**29.525 Modern British Drama (2 q.h.)**

The drama of England and Ireland of the twentieth century, reflecting the impact of modern life upon modern theatre.

**29.526 Modern American Drama (2 q.h.)**

A view of American drama from 1900 to the present time. The American playwright reflecting the social, philosophical, and psychological temper.

**29.531 Contemporary Film (2 q.h.)**

A survey of world film from the days of Edison's experiments to the present. Evaluation and critical review of representative films. Viewing of outstanding films.

**29.541 Workshop for the Actor I (2 q.h.)**

Physical preparation. Basic stage movement and deportment; the control of the stage voice; the analysis and establishment of characterization through observation and awareness of the body; improvisations and short scenes.

**29.542 Workshop for the Actor II (2 q.h.)**

Psychological preparation. The analysis and establishment of characterization through memory, emotion, imagination, and recall. Analysis of specific roles, the creation of a character analysis book, improvisations and short scenes.  
*Prereq.* 29.541.

**29.543 Workshop for the Actor III (2 q.h.)**

Preparing and performing the role. The physical and psychological preparation of specific roles. Short classroom scenes; the presentation of a one-act play.  
*Prereq.* 29.542.

**29.561 Announcing I (2 q.h.)**

A course dealing with the delivery of all types of radio commercials.

**29.562 Announcing II (2 q.h.)**

A course dealing with the delivery of prepared as well as ad lib materials so that the announcer may strengthen his spontaneous broadcast speech abilities.  
*Prereq.* 29.561.

**29.563 Announcing III (2 q.h.)**

A course dealing with a variety of ad lib program types in both radio and television to aid the announcer in developing his ability to think quickly and speak fluidly and dynamically. *Prereq.* 562.

**29.595 Charles Playhouse Seminar (2 q.h.)**

A seminar designed to teach students how to appreciate the experience of theatre going through pre-show preparation and post show critique, under the guidance of a faculty member as well as Charles Theatre artistic personnel.

**29.596 New York Theatre Seminar (2 q.h.)**

A seminar aimed at introducing the theatre arts to students by varied theatre going experiences as well as formal class discussions and studying the role of the New York stage in shaping contemporary American theatre.

**29.597 London Theatre Seminar (2 q.h.)**

Examination of the contemporary London theatre scene by viewing and evaluating representative productions.

**29.598 Stratford Shakespeare Seminar (2 q.h.)**

Seminar designed to give students an opportunity to attend four performances at the Stratford Festival Theatre: to meet with Festival actors, directors, designers; to tour the theatre plant; and to evaluate contemporary Shakespearian productions.

**29.599 Creative Dramatics**

Theories and methods of relating the creative techniques of pantomime improvisation; dramatization to work with children's programs in schools, churches, recreation facilities.

**29.600 Children's Theatre**

Analysis and creation of dramatic literature for children; the developing of a production for children.

### 30—ENGLISH

Consultant: Prof. P. C. Wermuth, Chairman, English Dept. (L.A. College)

Assoc. Consultants: Dean H. Vetstein (L.A. College)

Prof. M. Lesser (L.A. College)

*A student wishing to enroll in 30.601 or 30.603 should take an English Placement Examination prior to registration.*

*If his score is satisfactory, he will be entitled to register for 30.601 (Composition and Rhetoric I). If not, he will be entitled to enroll for 30.600 (Elements of Composition) a 2 q.h. credit course designed to improve his command of written English.*

*During the changeover of English requirements, the following will apply:*

*Students who have successfully completed:*

*30.504 may register for 30.602*

*30.505 may register for 30.604*

*30.507 may register for 30.605*

**30.501 English for International Students I (2 cl., non-credit)**

Introduction to English grammar for foreign-speaking students with an emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation. *Prereq. none.*

**30.502 English for International Students II (2 cl., non-credit)**

A continuation of 30.501 emphasizing the preparation of written and oral reports, and business and social correspondence.

**30.503 English for International Students III (2 cl., non-credit)**

Advanced work in written and spoken English preparatory to entering 30.504, English I.



**30.511 Business Writing and Reports I (2 q.h.)**

Developing an appropriate vocabulary and a business letter-writing philosophy.

**30.512 Business Writing and Reports II (2 q.h.)**

Planning, writing, and analyzing effective business letters. *Prereq.* 30.511 or *equiv.*

**30.513 Business Writing and Reports III (2 q.h.)**

Researching, organizing, documenting, and writing semi-technical and business reports. *Prereq.* 30.512 or *equiv.*

**30.514 Technical Writing I (2 q.h.)**

Introduction to types of technical documentation, memoranda, and technical reports. Writing of reports. *Prereq.* 30.506 or *equiv.*

**30.515 Technical Writing II (2 q.h.)**

Proposals, technical manuals, and graphic aids for printed documents and presentations. *Prereq.* 30.514 or *equiv.*

**30.516 Technical Writing III (2 q.h.)**

Technical writing, editing, and documentation, including information retrieval, programmed instruction, and reproduction processes. *Prereq.* 30.515 or *equiv.*

**30.517 Intermediate Writing (2 q.h.)**

Practice in expository and imaginative writing in a variety of forms, designed to help the student discover his own style. Individual attention to the student's work. *Prereq.* 30.506, 30.602 or *equiv.*

**30.518 Creative Writing I (2 q.h.)**

A workshop in writing short fiction. *Prereq.* 30.517 or *equiv.*

**30.519 Creative Writing II (2 q.h.)**

A workshop in analyzing and editing the participants' short fiction. *Prereq.* 30.518.

**30.522 Introduction to Semantics I (2 q.h.)**

The effect of language habits on thinking processes and on social relationships. *Prereq.* 30.506, 30.509, or *equiv.*

**30.523 Introduction to Semantics II (2 q.h.)**

A formulaic examination of language. *Prereq.* 30.522 or *equiv.*

**30.525 The English Language I (2 q.h.)**

An introduction to the scientific study of the backgrounds and historical development of the English language. *Prereq.* 30.506, 30.509 or *equiv.*

**30.526 The English Language II (2 q.h.)**

An examination of sounds, grammar, and usage. *Prereq.* 30.525 or *equiv.*

**30.527 The English Language III (2 q.h.)**

The problem of meaning and the symbolic nature of language. *Prereq.* 30.526

**30.531 Western World Literature I (2 q.h.)**

The Classical Age.

**30.532 Western World Literature II (2 q.h.)**

The Bible and the Middle Ages.

**30.533 Western World Literature III (2 q.h.)**

The Renaissance.

**30.534 Western World Literature IV (2 q.h.)**

The Neoclassical Age.

**30.535 Western World Literature V (2 q.h.)**

The Enlightenment.

**30.536 Western World Literature VI (2 q.h.)**

The Romantic Age and the rise of realism.

**30.541 English Literature I (2 q.h.)**

From early English to 1700.

**30.542 English Literature II (2 q.h.)**

From Neoclassicism to Romanticism.

**30.543 English Literature III (2 q.h.)**

From the Victorian Age to the present.

**30.544 American Literature I (2 q.h.)**

From Colonial times to Poe.

**30.545 American Literature II (2 q.h.)**

The American Renaissance: Emerson, Thoreau, Hawthorne, Melville, and Whitman.

**30.546 American Literature III (2 q.h.)**

From 1865 to the present.

**Note:** All English majors enrolling in Course 30.551 to 30.599 should have completed 30.509 and one full-year survey course (taken from those listed as 30.531 to 30.546) or secured the approval of the Dean.

**30.551 Chaucer I (2 q.h.)**

"The Canterbury Tales," with attention to Middle English vocabulary, historical setting, and the rhythms and devices of Chaucer's poetry.

**30.552 Chaucer II (2 q.h.)**

More of "The Canterbury Tales," and a beginning in the text of "Troilus and Criseyde." *Prereq.* 30.551 or *equiv.*

**30.553 Chaucer III (2 q.h.)**

An emphasis on "Troilus and Criseyde," and on certain shorter works of Chaucer. *Prereq.* 30.552 or *equiv.*

**30.554 Shakespeare I (2 q.h.)**

The Elizabethan theatre, Shakespeare's England, and the pre-1600 plays.

**30.555 Shakespeare II (2 q.h.)**

The "problematical" comedies and the histories. *Prereq.* 30.554 or equiv.

**30.556 Shakespeare III (2 q.h.)**

Emphasis on the major tragedies of Shakespeare. *Prereq.* 30.555 or equiv.

**30.557 The Seventeenth Century (2 q.h.)**

The literature of the Restoration.

**30.558 The Eighteenth Century I (2 q.h.)**

The age of Pope and Swift.

**30.559 The Eighteenth Century II (2 q.h.)**

The age of Johnson.

**30.561 Spenser (2 q.h.)**

"The Faerie Queene," studied as the English culmination of Medieval and Renaissance romantic narrative.

**30.562 Milton (2 q.h.)**

Close reading of "Paradise Lost," and of such political and theological background as needed. "Samson Agonistes" will also be read.

**30.564 The Old Testament I (2 q.h.)**

Selected books from the Old Testament examined for their literary and historical importance.

**30.565 The Old Testament II (2 q.h.)**

Continuation of 30.564.

**30.566 The New Testament (2 q.h.)**

Selected books from the New Testament considered in their literary and historical aspects.

**30.571 The Nineteenth Century I (2 q.h.)**

Wordsworth and Coleridge.

**30.572 The Nineteenth Century II (2 q.h.)**

Byron, Shelley, and Keats.

**30.573 The Nineteenth Century III (2 q.h.)**

The Victorian Age.

**30.574 The Eighteenth-Century English Novel (2 q.h.)**

From Defoe to Austen.

**30.575 The Nineteenth-Century English Novel (2 q.h.)**

From Bronte to Hardy.

**30.576 The Twentieth-Century English Novel (2 q.h.)**

From Conrad to the present.

**30.577 Conrad (2 q.h.)**

Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.

**30.578 Afro-American Literature (2 q.h.)**

A study of representative black authors of the United States, emphasizing the period from the Civil War to the present.

**30.581 The American Short Story (2 q.h.)**

The development of the American short story from its nineteenth-century origins to the present.

**30.582 The Nineteenth-Century American Novel (2 q.h.)**

From Cooper to Crane.

**30.583 The Twentieth-Century American Novel (2 q.h.)**

From Dreiser to the present.

**30.584 Contemporary American Poetry (2 q.h.)**

From Frost to the present.

**30.585 The Modern European Novel (2 q.h.)**

From Proust to the present.

**30.586 Literary Criticism (2 q.h.)**

Major schools of criticism through a study of Aristotle, Longinus, Sidney, Johnson, and a representative group of moderns.

**30.590 Writers' Conference (2 q.h.)**

A workshop in which professional writers will analyze participants' manuscripts.

**30.591 Honors Program I (4 q.h.)** See page 74.

**30.592 Honors Program II (4 q.h.)** Prereq. 30.591.

**30.593 Honors Program III (4 q.h.)** Prereq. 30.592.

**30.600 Elements of Composition (2 q.h.)**

An intensive study of grammatical forms and structural patterns of current English.

**30.601 Composition and Rhetoric I (2 q.h.)**

A detained examination of the modes of rhetoric, especially exposition and argument, and exercises in the development of paragraphs and short papers.

**30.602 Composition and Rhetoric II (2 q.h.)**

A continuation of 30.601. The stress here is on the short paper, the longer library paper, and formal documentation.

**30.603 Composition and Rhetoric (intensive) (4 q.h.)**

Same as 30.601 *plus* 30.602.

**30.604 Introduction to Literary Forms I (2 q.h.)**

The development of techniques for reading imagination writing. Short and long fiction are the materials for study, discussion, and two critical papers.

**30.605 Introduction to Literary Forms II (2 q.h.)**

A continuation of 30.604, but here the materials are poetry and drama.

**30.606 Introduction to Literary Forms (intensive) (4 q.h.)**

Same as 30.604 *plus* 30.605.

## **31—FRENCH**

Consultant: Prof. L. Cooperstein, Chairman, Modern Language Dept. (L.A. College)

**31.501 Elementary French I (3 q.h.)**

Essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary and idiomatic expressions.

**31.502 Elementary French II (3 q.h.)**

Continuation of grammar study. Oral and written exercises. *Prereq.* 31.501 or *equiv.*

**31.503 Elementary French III (3 q.h.)**

Reading of French prose of increasing difficulty, with written and oral exercises based on the materials read; practice in conversation. *Prereq.* 31.502 or *equiv.*

**31.504 Intermediate French I (3 q.h.)**

A review of grammar, with practice in composition and conversation. *Prereq.* 31.503 or *equiv.*

**31.505 Intermediate French II (3 q.h.)**

History of French civilization, with discussions and conversation. *Prereq.* 31.504 or *equiv.*

**31.506 Intermediate French III (3 q.h.)**

Intensive reading of modern French prose, with conversational practice. *Prereq.* 31.505 or *equiv.*

**31.507 Elementary French (Intensive) (9 q.h.)**

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation. Not open to students who have taken 31.501, 31.502, 31.503.

**31.508 Intermediate French (intensive) (9 q.h.)**

Same as 31.504, 31.505 and 31.506. Not open to students who have taken 31.504, 31.505, 31.506.

**31.521 French Literature I (2 q.h.)**

Origins of French Literature with readings from major works of the Middle Ages. *Prereq.* 31.506 or *equiv.*

**31.522 French Literature II (2 q.h.)**

Selections from the Classical period in the seventeenth and eighteenth centuries. *Prereq.* 31.521 or *equiv.*

**31.523 French Literature III (2 q.h.)**

Readings from major works of the nineteenth and twentieth centuries. *Pre-req.* 31.522 or *equiv.*

**32—SPANISH****32.501 Elementary Spanish I (3 q.h.)**

Essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary and idiomatic expressions.

**32.502 Elementary Spanish II (3 q.h.)**

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. *Prereq.* 32.501 or *equiv.*

**32.503 Elementary Spanish III (3 q.h.)**

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. *Prereq.* 32.502 or *equiv.*

**32.507 Elementary Spanish (Intensive) (9 q.h.)**

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation. Not open to students who have taken 32.501, 32.502, 32.503.

**32.504 Intermediate Spanish I (3 q.h.)**

Review of grammar, with practice in composition and conversation. *Prereq.* 32.503, 32.511 or *equiv.*

**32.505 Intermediate Spanish II (3 q.h.)**

Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. *Prereq.* 32.504 or *equiv.*

**32.506 Intermediate Spanish III (3 q.h.)**

Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. *Prereq.* 32.505 or *equiv.*

**32.508 Intermediate Spanish (intensive) (9 q.h.)**

Same as 32.504, 32.505 and 32.506. Not open to students who have had 32.504, 32.505, 32.506.

**32.509 Conversational Spanish I (3 q.h.)**

This course is intended to provide students with a basic speaking ability and understanding of everyday Spanish.

**32.510 Conversational Spanish II (3 q.h.)**

Continued building of basic skills in conversational Spanish. *Prereq.* 32.509 or *equiv.*

**32.511 Conversational Spanish III (3 q.h.)\***

A continuation of 32.510. *Prereq.* 32.510 or *equiv.*

**32.521 Spanish Literature I (2 q.h.)**

Origins of Spanish literature with readings from major works of the Middle Ages, the Romancero, and Mysticism. *Prereq.* 32.506 or *equiv.*

**32.522 Spanish Literature II (2 q.h.)**

Selections from Cervantes and other major figures of the Siglo de Oro. *Prereq.* 32.521 or *equiv.*

**32.523 Spanish Literature III (2 q.h.)**

Readings from major works of the nineteenth and twentieth centuries. *Prereq.* 32.522 or *equiv.*

**33—GERMAN****33.501 Elementary German I (3 q.h.)**

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

**33.502 Elementary German II (3 q.h.)**

More difficult points of grammar—particularly uses of subjunctive mood. *Prereq.* 33.501 or *equiv.*

**33.503 Elementary German III (3 q.h.)**

Reading of simple German prose, with oral and written exercises based on material read; German conversation encouraged. *Prereq.* 33.502 or *equiv.*

**33.504 Intermediate German I (3 q.h.)**

A review of grammar, with practice in composition and conversation. *Prereq.* 33.503 or *equiv.*

**33.505 Intermediate German II (3 q.h.)**

History of German civilization, with discussions and conversation. *Prereq.* 33.504 or *equiv.*

**33.506 Intermediate German III (3 q.h.)**

Intensive reading of modern German prose, with conversational practice. *Prereq.* 33.505 or *equiv.*

**34—RUSSIAN****34.501 Elementary Russian I (3 q.h.)**

Essentials of grammar; practice in pronunciation and progressive acquisition of a base vocabulary; idiomatic expressions.

**34.502 Elementary Russian II (3 q.h.)**

Continuation of grammar study; oral and written exercises. *Prereq.* 34.501 or *equiv.*

**34.503 Elementary Russian III (3 q.h.)**

Reading of Russian prose of moderate difficulty. *Prereq.* 34.502 or *equiv.*

\*Will satisfy the elementary language requirement, only.

**34.504 Intermediate Russian I (3 q.h.)**

Graded reading from the works of Pushkin, Lermontov, and Turgenev; oral and written practice based on the covered material. *Prereq.* 34.503 or equiv.

**34.505 Intermediate Russian II (3 q.h.)**

Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq.* 34.504 or equiv.

**34.506 Intermediate Russian III (3 q.h.)**

Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq.* 34.505 or equiv.

**34—JAPANESE****34.521 Elementary Japanese I (3 q.h.)**

Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

**34.522 Elementary Japanese II (3 q.h.)**

Continuation of grammar study; oral and written exercises. *Prereq.* 34.521 or equiv.

**34.523 Elementary Japanese III (3 q.h.)**

Reading of Japanese prose of moderate difficulty. *Prereq.* 34.522 or equiv.

**34.524 Intermediate Japanese I (3 q.h.)**

Review of grammar, with practice in composition and conversation. *Prereq.* 34.523 or equiv.

**34.525 Intermediate Japanese II (3 q.h.)**

Japanese history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq.* 34.524 or equiv.

**34.526 Intermediate Japanese III (3 q.h.)**

Japanese history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq.* 34.525 or equiv.

**34—ITALIAN****34.531 Elementary Italian I (3 q.h.)**

Essentials of grammar; practice in pronunciation; and progressive acquisition of a basic vocabulary and idiomatic expressions.

**34.532 Elementary Italian II (3 q.h.)**

Continuation of grammar study. Oral and written exercises. *Prereq.* 34.531 or equiv.

**34.533 Elementary Italian III (3 q.h.)**

Reading of Italian prose of increasing difficulty; with written and oral exercises based on the material read; practice in conversation. *Prereq.* 34.532 or equiv.

**34.534 Intermediate Italian I (3 q.h.)**

A review of grammar, with practice in composition and conversation. *Prereq.* 34.533 or equiv.

**34.535 Intermediate Italian II (3 q.h.)**

History of Italian civilization with discussions and conversation. *Prereq.* 34.534 or equiv.



**34.536 Intermediate Italian III (3 q.h.)**

Intensive reading of modern Italian prose, with conversational practice.  
*Prereq.* 34.535 or *equiv.*

**34—SWAHILI****34.541 Elementary Swahili I (3 q.h.)**

Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

**34.542 Elementary Swahili II (3 q.h.)**

Continuation of grammar study; oral and written exercises. *Prereq.* 34.541 or *equiv.*

**34.543 Elementary Swahili III (3 q.h.)**

Reading of Swahili prose of moderate difficulty. *Prereq.* 34.542 or *equiv.*

**34.544 Intermediate Swahili I (3 q.h.)**

Review of grammar, with practice in composition and conversation. *Prereq.* 34.543 or *equiv.*

**34.545 Intermediate Swahili II (3 q.h.)**

Swahili history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq.* 34.544 or *equiv.*

**34.546 Intermediate Swahili III (3 q.h.)**

Swahili history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq.* 34.545 or *equiv.*

**34—CHINESE****34.551 Mandarin Chinese I (3 q.h.)**

An introduction to sounds and structure of spoken and written Chinese (the standard or "national language" (*kuo-yu*). Stresses essentials of grammar, sentence pattern drills.

**34.552 Mandarin Chinese II (3 q.h.)**

Continuation of Chinese I. Essentials of grammar, reading of simple written Chinese. *Prereq.* 34.551 or *equiv.*

**34.553 Mandarin Chinese III (3 q.h.)**

Continuation of Chinese II. Grammar, reading Chinese with conversational drill to be based on material covered in class. *Prereq.* 34.552 or *equiv.*

**38—JOURNALISM**

*Consultant:* Prof. G. A. Speers, Chairman, Journalism Dept. (L.A. College)

**38.501 History and Principles of Journalism I (2 q.h.)**

Journalism from its European origins into the colonial period. The evolution of press freedoms and principles now and in the colonial press and the party press.

**38.502 History and Principles of Journalism II (2 q.h.)**

Journalism from 1800. The "Dark Period," the "Penny Press," and the great personal journalists: Bryant, Bennett, Greeley, Raymond, and others. *Prereq.* 38.501 or *equiv.*

**38.503 History and Principles of Journalism III (2 q.h.)**

The "giants" of American journalism in the closing decades of the nineteenth century: Dana, Greeley, Ochs, White, Medill, Pulitzer, Hearst and others. *Prereq.* 38.502 or *equiv.*

**38.504 Newswriting I (2 q.h.)**

Obtaining and organizing facts; the writing of basic news stories. Subjects covered include the five "W's" and the "H" of news, inverted pyramid form, news values, and leads.

**38.505 Newswriting II (2 q.h.)**

Analysis of different types of news stories through assignments and class discussions; building news stories; news interview stories, and other types. *Prereq.* 38.504.

**38.506 Newswriting III (2 q.h.)**

Investigative reporting, feature stories, editorials. Copy editing exercises and assignments. Discussion and assignments in specialized writing. Libel, slander, and other legal matters affecting journalism. *Prereq.* 38.506.

**39—ECONOMICS**

Consultant: Prof. M. A. Horowitz, Chairman, Economic Dept. (L.A. College)

Course Coordinator: Prof. H. Goldstein (L.A. College)

Mr. E. T. O'Donnell (Statistics)

**39.501 Economic Principles and Problems I (2 q.h.)**

Macro analysis—national income concepts and determination; macro economic goals and problems; monetary and fiscal policy.

**39.502 Economic Principles and Problems II (2 q.h.)**

Micro analysis—theory of the firm and market structure; supply, demand, market price; international economics. *Prereq.* 39.501 or *equiv.*

**39.503 Economic Principles and Problems III (2 q.h.)**

Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. *Prereq.* 39.502 or *equiv.*

**39.504 Economics (Intensive) (6 q.h.)**

Macro analysis—national income concepts and determination; macro economic goals and problems; monetary and fiscal policy. Micro analysis—theory of the firm and market structure; supply, demand, market price; international economics. Applications of economic principles to selected problem areas: poverty, competition, labor, agriculture, urban. Not open to students who have taken 39.501, 39.502, 39.503.

**39.505 Economics A (3 q. h.)**

Same as 39.501 plus the first half of 39.502

**39.506 Economics B (3 q.h.)**

Same as the second half of 39.502 plus 39.503. *Prereq.* 39.505 or *equiv.*

**39.507 Intermediate Economic Theory I (2 q.h.)**

Classical equilibrium theory. Theory of demand, supply and market price. Marginal analysis. *Prereq.* 39.503 or *equiv.*

**39.508 Intermediate Economic Theory II (2 q.h.)**

Determination of price and output in the context of the theory of the firm. *Prereq.* 39.507 or *equiv.*

**39.509 Intermediate Economic Theory III (2 q.h.)**

Introduction to mathematical analysis and a comprehensive analysis of the theory of distribution. *Prereq.* 39.508 or *equiv.*

**39.511 Statistics I (2 q.h.)**

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq.* 39.503 or *equiv.*

**39.512 Statistics II (2 q.h.)**

Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. *Prereq.* 39.511 or *equiv.*

**39.513 Statistics III (2 q.h.)**

Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *Prereq.* 39.512 or *equiv.*

**39.514 Statistics (Intensive) ( 6 q.h.)**

Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. Not open to students who have taken 39.511, 39.512, 39.513. *Prereq.* 39.503 or *equiv.*

**39.517 Money and Banking I (2 q.h.)**

Introduction to money and credit, commercial banking structure, and money creation; problems and policy of central banking in the United States. *Prereq.* 39.503 or *equiv.*

**39.518 Money and Banking II (2 q.h.)**

Theory of money and prices and monetary policy; interest theory, debt management, and international monetary problems and analysis. *Prereq.* 39.517 or *equiv.*

**39.519 Public Finance (2 q.h.)**

Analysis of the growth and development of the public sector of the economy. Public finance policies, intergovernment fiscal relations. *Prereq.* 39.518 or *equiv.*

**39.521 Economic Growth and Development I (2 q.h.)**

Analysis of the development of the western market system. Introduction to economic growth and alternative approaches to economic development. *Prereq.* 39.503 or *equiv.*

**39.522 Economic Growth and Development II (2 q.h.)**

An introductory analysis of the role of economic factors and institutions as well as an examination of the effect of psychological social and political influences upon economic development. *Prereq.* 39.521 or *equiv.*

**39.523 Government and Business I (2 q.h.)**

Role of government in national economic affairs-theory and practice. *Prereq.* 39.503 or *equiv.*

**39.524 Government and Business II (2 q.h.)**

The relationship between government and business and anti-trust laws. *Prereq.* 39.523 or *equiv.*

**39.525 American Economic History (2 q.h.)**

Economic development of the United States with emphasis upon the post Civil War period and selected European developments. *Prereq.* 39.503 or equiv.

**39.526 Government and Business III (2 q.h.)**

Application of anti-trust laws to business—emphasis upon cases, principles, and current anti-trust problems. *Prereq.* 39.524 or equiv.

**39.527 Labor Economics (2 q.h.)**

Development of labor organizations, their aims and methods. Issues in collective bargaining and public policy toward labor. *Prereq.* 39.503 or equiv.

**39.528 International Economics I (2 q.h.)**

Economics of international trade, tariffs and resource use, and balance of payments mechanisms. *Prereq.* 39.503 or equiv.

**39.529 International Economics II (2 q.h.)**

International commercial policy, financial organizations, and recent problems. *Prereq.* 39.528 or equiv.

**39.530 Comparative Economic Systems (2 q.h.)**

Analysis and evaluation of different economic systems: capitalism, socialism, communism, and fascism. *Prereq.* 39.503 or equiv.

**39.531 Business Cycles I (2 q.h.)**

Intermediate macro economic theory. Theory of cyclical fluctuations in the context of multiplier and accelerator models. *Prereq.* 39.503 or equiv.

**39.532 Business Cycles II (2 q.h.)**

Business cycle analysis, measurement, and public policy. *Prereq.* 39.531 or equiv.

**39.533 Business Cycles III (2 q.h.)**

Business cycle forecasting methods and services. *Prereq.* 39.532 or equiv.

**39.536 Advanced Statistics I (2 q.h.)**

Advanced topics in sampling and statistical inference as a management aid. *Prereq.* 39.503, 39.513 or equiv.

**39.537 Advanced Statistics II (2 q.h.)**

Elements in probability theory and the decomposition of economic change into secular, seasonal, and cyclical variation. *Prereq.* 39.536 or equiv.

**39.538 Advanced Statistics III (2 q.h.)**

Advanced topics in statistical inference, regression, and correlation and index numbers. *Prereq.* 39.537 or equiv.

**39.539 Managerial Economics (2 q.h.)**

An application of the theory of demand, price, and output to the business firm and capital budgeting. *Prereq.* 39.503 or equiv.

**39.540 History of Economic Thought (2 q.h.)**

Development of economic theory through Keynesian and post-Keynesian analysis. *Prereq.* 39.503 or equiv.

**39.551 Industrial Organization (2 q.h.)**

An extension and application of micro-theory to structure and performance of American industry. Anti-trust policy and analysis. *Prereq.* 39.503 or equiv.

**39.561 Urban Economics (2 q.h.)**

A study of urban affairs in the context of economic principles. *Prereq.* 39.503 or *equiv.*

**39.571 European Economic History (2 q.h.)**

An analysis of European economic affairs after the industrial revolution. The twentieth century and recent integration policies and their analysis. *Prereq.* 39.503 or *equiv.*

**39.581 Economic Policy Seminar (2 q.h.)**

Capstone course for senior majors with stress upon independent study and contemporary issues. *Prereq.* 39.509, 39.531 or *equiv.*

## 40—LIBRARY SCIENCE

*Consultant:* Mr. R. L. Waller, Attleboro Public Library

**40.501 Introduction to Library Science (2 q.h.)**

Brief survey of the history of books and librarianship. The development of libraries in the United States with some emphasis on recent federal and state library legislation. The library profession, its philosophy, publications, and organizations.

**40.502 Selection of Library Materials (2 q.h.)**

Principles and practices in the selection of printed materials and audio-visual aids for the modern library; practice in preparation of book notes and book reviews.

**40.511 Organization of the Library (2 q.h.)**

The organization, administration, and services of municipal libraries, with particular emphasis on the larger unit systems; the role of public libraries as educational institutions.

**40.512 Building the School Library (2 q.h.)**

Organization and management of elementary and secondary school libraries; problems in the selection and evaluation of books and periodicals necessary to the school curriculum.

**40.513 School Library Administration (2 q.h.)**

The library as a media center for instructional materials; problems in personnel and budgeting; the library's role in the school curriculum and its services to students and faculty.

**40.514 Audio-Visual Materials and Services (2 q.h.)**

The selection, organization, and use of audio-visual materials in school libraries; types of equipment and service.

**40.521 Introduction to Reference Materials and Methods (2 q.h.)**

The basic tools and methods for locating information. Evaluation of dictionaries, encyclopedias, gazetteers and atlases, handbooks, almanacs, directories, and indexes.

**40.522 Advanced Reference Bibliography I—Reference Work in The Social Sciences (2 q.h.)**

Scope and use of outstanding reference materials in the broad range of the social sciences—economics, education, political science, sociology, and allied fields. *Prereq.* 40.521 or *equiv.*

**40.523 Advanced Reference and Bibliography II—Reference Work in The Humanities. (2 q.h.)**

Development of the book, and the beginnings of enumerative and descriptive bibliography. Approaches to the solution of reference problems in the humanities, with special emphasis on literature. *Prereq.* 40.521 or *equiv.*

**40.524 Advanced Reference and Bibliography III—Reference Work in Science and Technology (2 q.h.)**

Methodology and resources for reference work in mathematics, technology, and the physical and biological sciences. *Prereq.* 40.521 or *equiv.*

**40.531 Introduction to Cataloging and Classification (2 q.h.)**

Theory and practice in descriptive cataloging, using the Anglo-American Cataloging Rules; emphasis on Dewey Decimal Classification and Sears subject headings.

**40.532 Advanced Cataloging and Classification (2 q.h.)**

Further study of descriptive cataloging and classification; introduction to corporate entries, shelflists, authority files, and serial publications. *Prereq.* 40.531.

**40.533 Library of Congress Classification (2 q.h.)**

The significant differences between LC and Dewey. Notes on original cataloging and techniques of classification within the LC scheme. Use of LC outlines and tables. *Prereq.* 40.531 or *equiv.*

**40.541 Introduction to Children's Literature (2 q.h.)**

The history and development of children's literature; current trends in its publication and the social forces that influence its production; standard practices of selection and evaluation of the various types of children's books.

**40.542 Library Service to Young People (2 q.h.)**

Study of adolescent interest and academic needs in the field of literature with application to both public and school libraries; special attention to the problems of book selection, book talks, and discussion groups.

**40.551 Special Libraries (2 q.h.)**

The purpose, development, and administration of the special library-industrial, scientific, business, and other types.

**41—ACCOUNTING****41.501 Accounting Principles I (2 q.h.)**

The basic concepts and methodology of accounting for service and merchandising businesses.

**41.502 Accounting Principles II (2 q.h.)**

The problems of income measurement and valuation related to sources and uses of invested capital. *Prereq.* 41.501.

**41.503 Accounting Principles III (2 q.h.)**

The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. *Prereq.* 41.502.

**41.541 Accounting Principles (intensive) (6 q.h.)**

Basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. Not open to students who have taken 41.501, 41.502, 41.503.



**41.504 Intermediate Accounting I (2 q.h.)**

The study of generally accepted accounting principles as applicable to the preparation of financial statements. Accounting for cash, securities, and receivables. *Prereq.* 41.503.

**41.505 Intermediate Accounting II (2 q.h.)**

The use of various systems for accounting for the flow of inventory in a merchandising or manufacturing operation. Long term investments as a means of providing stability to the concern. *Prereq.* 41.504.

**41.506 Intermediate Accounting III (2 q.h.)**

The problems of long term asset acquisition and write-off through depreciation, amortization, and depletion methods. *Prereq.* 41.505.

**41.542 Intermediate Accounting (intensive) (6 q.h.)**

The study of generally accepted accounting principles as applicable to the preparation of financial statements. Accounting for cash, securities, and receivables. The use of various systems for accounting for the flow of inventory in a merchandising or manufacturing operation. Long term investments as a means of providing stability to the concern. The problem of long term asset acquisition and write-off through depreciation, amortization, and depletion methods. Not open to students who have taken 41.504, 41.505, 41.506. *Prereq.* 41.503.

**41.507 Cost Accounting I (2 q.h.)**

The foundations of cost accounting, including terminology, purposes, and relationship to financial accounting. *Prereq.* 41.503.

**41.508 Cost Accounting II (2 q.h.)**

The planning and control of current operations through the use of standard costs and budgets. *Prereq.* 41.507.

**41.509 Cost Accounting III (2 q.h.)**

The use of cost accounting in special decisions and in long range planning. *Prereq.* 41.508.

**41.510 Advanced Accounting I\* (2 q.h.)**

The accounting problems encountered through the issuance of capital stock, both at issue date and at subsequent dates. *Prereq.* 41.506.

**41.511 Advanced Accounting II\* (2 q.h.)**

The techniques of statement analysis, using both internal and external information. A complete examination of cash and fund flow as it is used by the accountant and the analyst. *Prereq.* 41.510.

**41.512 Advanced Accounting III\* (2 q.h.)**

The introduction of special problems posed by partnerships, and estates, and trusts. *Prereq.* 41.511.

**41.513 Specialized Problems I\* (2 q.h.)**

The problems of accounting for special sales. Introduction of the concepts of present value and its use in accounting. *Prereq.* 41.512.

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\*Upper level Business Administration course—see p. 51.

**41.514 Specialized Problems II\* (2 q.h.)**

The use of consolidated statements in conjunction with newly developing trends toward multi-purpose companies, combinations, mergers, and pools. *Prereq.* 41.513.

**41.515 Specialized Problems III\* (2 q.h.)**

The use of specialized systems and financial statements by companies. *Prereq.* 41.514.

**41.516 Auditing I\* (2 q.h.)**

The examination of modern auditing requirements relative to the professional ethics and legal responsibility of the certified public accountant and the public accountant. *Prereq.* 41.512.

**41.517 Auditing II\* (2 q.h.)**

The methods and approach used in auditing assets of the firm. *Prereq.* 41.516.

**41.518 Auditing III\* (2 q.h.)**

The methods and approach used in auditing liabilities, owner equity, and nominal accounts of the firm. *Prereq.* 41.517.

**41.519 Federal Income Taxes I\* (2 q.h.)**

The application of the Federal Tax Law to the individual's income, gains, losses and expenses. *Prereq.* 41.515.

**41.520 Federal Income Taxes II (2 q.h.)**

The application of the Federal Tax Law to the individual's special deductions. Installment sales; income average. *Prereq.* 41.519.

**41.521 Federal Income Taxes III\* (2 q.h.)**

The application of Federal Tax Law to corporations. *Prereq.* 41.520.

**41.522 Seminar in Contemporary Accounting Problems\* (2 q.h.)**

The careful examination of the underlying concepts and conventions of accounting, and their application to financial statements. *Prereq.* 41.515 and 41.509.

**41.523 Seminar in Contemporary Accounting Problems\* (2 q.h.)**

The careful examination of the areas of revenue and income recognition, cost determination and allocation, and depreciation. *Prereq.* 41.522.

**41.524 Seminar in Contemporary Accounting Problems\* (2 q.h.)**

The careful examination of newly developing accounting areas such as pensions, leases, stock options, and business combinations. *Prereq.* 41.523.

**41.525 Estate and Gift Taxes\* (2 q.h.)**

An examination of the relevant Internal Revenue Code provisions, property included in gross estate, including lifetime transfers which remain subject to some control by donor; marital and charitable deductions; administrative expenses; estate planning. *Prereq.* 41.521.

**41.526 Corporate and Stockholder Tax Problems I\* (2 q.h.)**

Real estate transactions, stock market options, transfers of appreciated assets to donees, patents, sale of franchise rights, and redemptions of stock in closely held corporations. *Prereq.* 41.525.

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\*Upper level Business Administration course—see p. 51.



**41.527 Corporate and Stockholder Tax Problems II\* (2 q.h.)**

Contribution of assets, Section 301 distributions, preferred stock, partial liquidations, spin-offs; collapsible corporations, unreasonable accumulations, personal holding companies, and elements of reorganizations. *Prereq.* 41.526.

**41.533 Accounting for Management Decisions (non-accounting majors) (2 q.h.)**

The preparation and interpretation of financial statements, including cash and fund flow, for internal use by the company. *Prereq.* 41.503.

**41.534 Accounting for Management Decisions (non-accounting majors) (2 q.h.)**

The preparation and interpretation of cost accounting information. *Prereq.* 41.533.

**41.535 Accounting for Management Decisions (non-accounting majors) (2 q.h.)**

The utilization of accounting information for management decisions. *Prereq.* 41.534.

**41.543 Accounting for Management Decisions (intensive) (non-accounting majors) (6 q.h.)**

The preparation and interpretation of financial statements, including cash and fund flow, for internal use by the company. The preparation and interpretation of cost accounting information and the utilization of accounting information for management decisions. Not open to students who have taken 41.533, 41.534, 41.535. *Prereq.* 41.503.

### 43—MARKETING

**43.501 Introduction to Marketing I (2 q.h.)**

A description and evaluation of the marketing system and an introduction to the decision-making process.

**43.502 Introduction to Marketing II (2 q.h.)**

A continuation of Marketing I with emphasis upon specific marketing functions and their application through the use of case studies and analysis. *Prereq.* 43.501.

**43.503 Introduction to Marketing III (2 q.h.)**

A continuation of the case method plus discussion and analysis of current marketing issues and problems. *Prereq.* 43.502.

**43.504 Introduction to Marketing (intensive) (6 q.h.)**

A description and evaluation of the marketing system and an introduction to the decision-making process, with emphasis upon specific marketing functions and their application through the use of case studies and analysis. A continuation of the case method plus discussion and analysis of current marketing issues and problems. Not open to students who have taken 43.501, 43.502, 43.503.

**43.507 Sales Management I (2 q.h.)**

The basic principles of personal selling and salesmanship. *Prereq.* 43.503.

**43.508 Sales Management II (2 q.h.)**

Personal selling through wholesalers distributors, retailers, and direct to the user, in both consumer and industrial channels. *Prereq.* 43.507.

**43.509 Sales Management III (2 q.h.)**

Organization of the sales department, planning and directing sales force activities, operation and supervision of the sales force, and evaluation of results. *Prereq.* 43.508.

**43.511 Creative Marketing Communications I (2 q.h.)**

The tools, techniques, and principles of advertising communication and motivation and their use in creative marketing effort. *Prereq.* 43.503.

**43.512 Creative Marketing Communications II (2 q.h.)**

Continued emphasis upon the creative aspects of marketing communications and the use of media and the specific techniques of advertising and sales promotion, and their coordination with personal selling, in the effective stimulation of sales. *Prereq.* 43.511.

**43.513 Creative Marketing Communications III (2 q.h.)**

The case method is used to develop analytical and decision-making ability in the management of all the tools of the "communications mix". *Prereq.* 43.512.

**43.518 Retailing I (2 q.h.)**

The marketing concept and retail management, retail profit and loss. Starting a retail business, store location, store planning, and the retail organization.

**43.519 Retailing II (2 q.h.)**

Merchandising planning and control, pricing, and buying.

**43.522 Retailing III (2 q.h.)**

Distribution of merchandise, sales promotion, customers' services, retail accounting, and expense management.

**43.520 Industrial Marketing (2 q.h.)**

The marketing of products where other business firms and organizations are the customers, including a study of physical distribution, marketing concepts, and the decision-making process relevant to the marketing of business goods. *Prereq.* 43.503.

**43.525 Marketing Research I\* (2 q.h.)**

Introductory presentation and evaluation of procedures and techniques currently available to improve the chances of marketing success and effectiveness. *Prereq.* 43.503, 39.513, 45.572.

**43.526 Marketing Research II\* (2 q.h.)**

Modern techniques of data collection and analysis, both quantitative and qualitative, in marketing research, forecasting, product planning, test marketing, marketing evaluation, and the application of modern data-processing techniques. *Prereq.* 43.525.

**43.529 International Marketing (2 q.h.)**

Opportunities, methods, and policies required for the successful development and management of international business and marketing operations. *Prereq.* 43.503.

**43.532 Marketing Management I\* (2 q.h.)**

Advanced management and decision-making covering the complete marketing spectrum are analyzed in a variety of case studies and problems. *Prereq.* 43.503.

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\*Upper level Business Administration course—see p. 51.

**43.533 Marketing Management II\* (2 q.h.)**

Using a seminar-type approach, emphasis is placed upon problem-solving in such areas as sales, logistics and physical distribution, advertising, pricing, new development, public and governmental policy. *Prereq.* 43.532.

**43.534 Marketing Management III\* (2 q.h.)**

A continuation of Marketing Management II, with increased emphasis upon case analysis and study. *Prereq.* 43.533.

**43.536 Advertising Techniques (2 q.h.)**

A study of the verbal and visual means of motivation, with emphasis upon the techniques and process used to produce advertising in newspapers, radio, television, and other media. *Prereq.* 43.503.

**43.537 Marketing and Sales Seminar\* (2 q.h.)**

A one-quarter, cap-stone course to round out the student's study of marketing through investigation and analysis of the most recent trends in marketing management, finance, logistics, sales, advertising, and promotion. *Prereq.* 43.534.

**43.541 Public Relations I (2 q.h.)**

Introduction to the basic principles, purposes, and methods of public relations. *Prereq.* 43.503.

**43.542 Public Relations II (2 q.h.)**

A continuation of Public Relations I providing in-depth coverage of the planning, management, operation, and evaluation of public relations programs, including case analysis. *Prereq.* 43.541.

## 44—FINANCE AND INSURANCE

### Finance

**44.501 Capital Institutions and Risk Management I (2 q.h.)**

An introduction to various financial institutions and their functions; e.g., commercial banks, the Federal Reserve System, savings institutions.

**44.502 Capital Institutions and Risk Management II (2 q.h.)**

A survey of the security markets with special emphasis on common stocks, bonds, and investment companies.

**44.503 Capital Institutions and Risk Management III (2 q.h.)**

An analysis of the basic institutions and principles in risk and insurance.

**44.504 Capital Institutions and Risk Management (intensive) (6 q.h.)**

An introduction to various financial institutions and their functions; e.g., commercial banks, the Federal Reserve System, savings institutions. A survey of the security markets with special emphasis on common stocks, bonds, and investment companies. An analysis of the basic institutions and principles in risk and insurance. Not open to students who have taken 44.501, 44.502, 44.503.

**44.505 Corporate Finance (intensive) (6 q.h.)**

An introduction to the role of financial management of the business firm. Review of financial statements, promotion, and forms of organization. Planning the use of assets and cost of capital concepts are introduced as management evaluation techniques. An analytical approach to capital budgeting and optimum asset returns. Cost of capital is further developed and applied against consideration of capital mixture. Not open to students who have taken 44.507, 44.508, 44.509. *Prereq.* 44.501.

\*Upper level Business Administration course—see p. 51.

**44.507 Corporate Finance I (2 q.h.)**

An introduction to the role of financial management of the business firm. Review of financial statements, promotion, and forms of organization. Planning the use of assets and cost of capital concepts are introduced as management evaluation techniques. *Prereq.* 44.501.

**44.508 Corporate Finance II (2 q.h.)**

An analytical approach to capital budgeting and optimum asset returns. Cost of capital is further developed and applied against consideration of capital mixture. *Prereq.* 44.507.

**44.509 Corporate Finance III (2 q.h.)**

The analysis of various financial tools are considered. An intensive examination of short and intermediate term credit, as well as the distribution of stocks and bonds to the public and special buyers. A survey of reorganization and liquidation techniques are analyzed. *Prereq.* 44.508.

**44.517 Investments I\* (2 q.h.)**

Investment goals and objectives are considered. Various types of investment are compared and the role of the securities markets examined. *Prereq.* 44.509.

**44.518 Investments II\* (2 q.h.)**

Broad coverage of the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the corporation as they apply to the investment analyst's techniques. *Prereq.* 44.517.

**44.519 Investments III\* (2 q.h.)**

The relation of earnings, dividends, and cash flow to market valuation of a company's securities. Portfolio analysis and planning are examined, as well as methods of security selection. Technical and fundamental factors are also considered. *Prereq.* 44.518.

**44.521 Credit Management I\* (2 q.h.)**

An introduction to credit and its functions, including the role of the credit executive, credit investigation, documentary credit, trade credit. *Prereq.* 44.509.

**44.522 Credit Management II\* (2 q.h.)**

The organization and function of credit departments; various forms of credit and collection services. *Prereq.* 44.521.

**44.523 Credit Management III\* (2 q.h.)**

Analysis of financial statements to determine credit worthiness, creditor's rights, adjustment bureau, credit insurance, and guarantees. *Prereq.* 44.522.

**44.531, 44.532 Seminar in Finance I, II\* (4 q.h.)**

Student participation in the study and analysis of case histories. Individual papers presented. *Prereq.* All finance courses.

**44.544 Law of Finance\* (2 q.h.)**

A consideration of the legal problems immediately affecting finance. Special attention is given to the field of corporate law. *Prereq.* 44.509, 45.543.

\*Upper level Business Administration course—see p. 51.

## Insurance

**44.511 Life Insurance I (2 q.h.)**

A study of the mathematics of life insurance including rate-making, reserves, the various contracts, including legal concepts, and settlement options. *Prereq.* 44.503.

**44.512 Life Insurance II (2 q.h.)**

A study of the mathematics of life insurance including rate-making, reserves, surrender values, as well as the operations of the companies, their financial investments and their regulation. *Prereq.* 44.511.

**44.513 Estate Planning\* (2 q.h.)**

A study of the various "tools" used in creating, conserving, and ultimate distribution of estates, including wills, trusts, settlement options, and proper tax planning. *Prereq.* 44.512, 45.543.

**44.514 Property & Casualty Insurance I (2 q.h.)**

A study of the economic basis for insurance and of the various fire, marine and casualty insurance contracts. *Prereq.* 44.503.

**44.515 Property & Casualty Insurance II (2 q.h.)**

Continued analysis of the various contracts, as well as underwriting, rate-making, and loss prevention and loss adjustment. *Prereq.* 44.514.

**44.516 Property & Casualty Insurance III (2 q.h.)**

A study of the mechanics of the insurance industry, including types of companies, reserves, reinsurance, financial analysis and government regulation. *Prereq.* 44.515.

**44.525 Health and Social Insurance I\* (2 q.h.)**

A study of the economic basis served by health and social programs of insurance, including a detailed analysis and comparison of the plans offered. *Prereq.* 44.503.

**44.526 Health and Social Insurance II\* (2 q.h.)**

A continuing study of contracts, including benefit structure, rate-making, reserves and the proper use and coordination of the plans available from private industry and from the government. *Prereq.* 44.525.

**44.527 Business and Group Insurance and Pensions\* (2 q.h.)**

A study of the proper use of life and health insurance contracts in meeting and solving business situations, designing employee benefit plans, and in establishing retirement plans. *Prereq.* 44.526.

**44.529 Advanced Property Insurance\* (2 q.h.)**

A study of the plans and programs designed to provide protection for multi-peril, diversified industrial and commercial organizations. *Prereq.* 44.515.

**44.530 Advanced Property-Casualty Insurance\* (2 q.h.)**

A study of the various plans and programs for providing liability and casualty protection for commercial and industrial organizations. *Prereq.* 44.515.

**44.540 Advanced Risk Analysis and Treatment I\* (2 q.h.)**

A study of the risks to which all individuals and businesses are exposed, their identification, and evaluation of loss potential. *Prereq.* 44.516.

\*Upper level Business Administration course—see p. 51.

**44.541 Advanced Risk Analysis and Treatment II\* (2 q.h.)**

A study of the proper use of insurance, self-insurance, programs of loss prevention and reduction and the use of case studies to test the designated plans. *Prereq.* 44.540.

**44.543 Law of Insurance\* (2 q.h.)**

A study of the legal problems affecting insurance, including regulation design and interpretation of contracts and the relationship between the insurance company, its agent, and the public. *Prereq.* 45.543.

**45—MANAGEMENT****General Management****45.501 Management and Organization I (2 q.h.)**

Describes the environment within which business operates and from this develops the theory and practice of organization.

**45.502 Management and Organization II (2 q.h.)**

Building on 45.501, develops the "what" and "how" of the management process. *Prereq.* 45.501.

**45.503 Management and Organization III (2 q.h.)**

Applies the concepts of organization and management to the functional areas of business—marketing, production, personnel, and finance. *Prereq.* 45.502.

**45.652 Management and Organization (intensive) (6 q.h.)**

Describes the environment within which business operates and from this develops the theory and practice of organization. Develops the "what" and "how" of the management process. The concepts of organization and management to the functional areas of business-marketing, production, personnel, and finance. Not open to students who have taken 45.501, 45.502, 45.503.

**45.504 Administrative Management & Office Services I (2 q.h.)**

Principles and techniques of modern administrative management including organization, planning, office mechanization, computers, information requirements analysis, and the conducting of a systems study.

**45.604 Administrative Management & Office Services II (2 q.h.)**

An analysis of systems and procedures, business writing, report structuring, records management, control techniques, staffing, and methods of directing the administrative management function.

**45.523, 524, 525 Management Seminar I, II, III\* (6 q.h.)**

The development of an integrated analysis of business problems from the upper-management point of view. Provides an opportunity to bring theory into practice through case study analysis.

**45.646 Management Seminar (intensive)\* (6 q.h.)**

The development of an integrated analysis of business problems from the upper-management point of view. Provides an opportunity to bring theory into practice through case study and analysis. Not open to students who have taken 45.523, 45.524, 45.525.

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\*Upper level Business Administration course—see p. 51.



**45.533, 534, 535 Management Decisions & Policies\* (6 q.h.)**

This course takes the viewpoint of top management in planning effective relationships between the corporation and its environment. Emphasis will be placed on sensing, analysing, evaluating, and responding to demographic, cultural, political, and technological change in the business environment. Subjects studied include the functions and responsibilities of top management, the problems which affect the character and success of the total enterprise, operations in foreign environments, the impact of government regulations, corporate strategies for dealing with power-possessing entities in the environment. Cases are drawn from companies of various sizes in widely diversified industries operating in a variety of environments. *Prereq.* 44.503.

**45.606 Management Decisions & Policies (intensive)\* (6 q.h.)**

This course takes the viewpoint of top management in planning effective relationships between the corporation and its environment. Emphasis will be placed on sensing, analyzing, evaluation, and responding to demographic, cultural, political, and technological change in the business environment. Subjects studied include the functions and responsibilities of top management, the problems which affect the character and success of the total enterprise, operations in foreign environments, the impact of government regulations, and corporate strategies for dealing with power-possessing entities in the environment. Cases are drawn from companies of various sizes in widely diversified industries operating in a variety of environments. Not open to students who have taken 45.533, 45.534, 45.535. *Prereq.* 44.503.

**45.600, 45.601, 45.602 Small Business Management I, II, III (6 q.h.)**

For those who wish to explore the opportunities of being in business for themselves. Subjects considered include objective self-analysis; discovery of opportunities in the manufacturing, retailing and service fields; raising and conservation of capital; organization and site location factors; management controls in relation to legal, financial, personnel, and marketing problems.

**45.670 The Management of Change I (2 q.h.)**

The firm as perceived in current terms is explored. Selected readings of significant dynamic management theorists are studied. Evaluation of business performance as related to dynamic company objectives; recognition of need for change; the exploration, development, and synthesis of the conceptual and practical implications of change dynamics; the dimensions of change—rate and direction—will be established; change as a management objective. *Prereq.* 45.503.

**45.671 The Management of Change II (2 q.h.)**

The transitional organization and the process of organizational change are studied; implications of technological advances on company operations; the firm and/or environment as causative change agents; establishment of planned, profit-oriented change strategies; the transitional manager; innovative principles of administration and organization; the resistance to change; measurement and control of change dimensions. Case studies on the social, economic and political forces shaping society. *Prereq.* 45.670.

**45.672 The Management of Change III (2 q.h.)**

Conceptual approaches applied to the emerging organization are considered: administrative and organizational flexibility, strategy/structure synergism; integration of profit and social responsibility; industrial productivity and leisure time; interrelationship among economic, technological, social and political change and their impact on the firm; the systems manager; the development of a model for change. *Prereq.* 45.672.

## Industrial Management Courses

**45.506 Production Management & Manufacturing Systems I (2 q.h.)**

Analysis of the basic areas of production management, characteristic activities, typical decisions, and the fundamental qualitative and quantitative approaches used in the inherent decision-making process, including production and facilities planning and investment analysis, and selected case studies.

**49.501 Environmental Management I (2 q.h.)**

The state of our environment now and in the future—an introduction to the types and threats of pollution, including the atmosphere, land and waterways. Emphasis placed on impact of pollution upon economic growth, business profitability, governmental outlays and individual expenditures. Lectures, class participation, and selected readings. Written reports required.

**49.502 Environmental Management II (2 q.h.)**

A continuation of Environmental Pollution I in which the level of our technology is explored. A review of control techniques, disposal systems and purification equipment with an evaluation of their effectiveness and costs. Critical unsolved technical problems and the needs for scientific investigation will be highlighted. Lectures, class participation, and selected readings. Written reports required. *Prereq.* 49.501.

**49.503 Environmental Management III (2 q.h.)**

A continuation of Environmental Pollution II in which past, present and future controlling and corrective actions of business and government and the individual are examined. Evaluation of the balance between responsible self control and preventive legislation. Specific attention to the complexity of interacting factors and the dilemma of productivity demands versus the environmental limitations of adaptability. Lectures, class participation, and selected readings. Written reports required. *Prereq.* 49.502.

**49.504 Strategy for Planning I (3 q.h.)**

Students are provided an opportunity to use a full range of skills and experience to make key decisions in planning and operating a company in an uncertain, competitive environment. Students participate as team members in a computerized decision-making exercise. Course materials, class discussions and guest lecturers will expose the student to planning techniques, systems, and issues with which executive management becomes involved. This class will meet once per week for 2½ hours. Open only to students of junior or senior status. Offered Fall Quarters only.

**49.505 Strategy for Planning II (3 q.h.)**

A continuation of 49.504. Students will have continued opportunities to analyze results of previous decision-making, engage in additional planning and decision-making, and conduct board meetings. This class will meet once per week for 2½ hours. *Prereq.* 49.504. Offered Winter Quarters only.

**45.507 Production Management & Manufacturing Systems II (2 q.h.)**

Further analysis of production systems, including inventory control, production control and data processing as applied to the problems and environment of manufacturing; selected case studies. *Prereq.* 45.506.

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\*Upper level Business Administration course—see p. 51.



**45.508 Production Management & Manufacturing Systems III (2 q.h.)**

Continuing and additional area of manufacturing are analyzed, including quality control, statistical quality control, methods analysis and improvement, work measurement, and wage incentives; selected case studies. *Prereq.* 45.507.

**45.642 Production Management & Manufacturing Systems (intensive) (6 q.h.)**

Analysis of the basic areas of production management, characteristic activities, typical decisions, and the fundamental qualitative and quantitative approaches used in the inherent decision-making process, including production and facilities planning and investment analysis; selected case studies. Analysis of production systems, including inventory control, production control and data processing as applied to the problems and environment of manufacturing; selected case studies. Additional areas of manufacturing are analyzed, including quality control, statistical quality control, methods analysis and improvement, work measurement, and wage incentives; selected case studies. Not open to students who have taken 45.506, 45.507, 45.508.

**45.519 Work Methods (2 q.h.)**

The principles of motion economy and work simplification in analysis and improvement of methods, utilizing flow charts, diagrams, work station activity charts, and laboratory techniques.

**45.522 Job Evaluation (2 q.h.)**

Wage-payment systems; theory of wage determination, job elements, rating scales, writing job descriptions and specifications; selection of plans; development of wage structures and integration with the principles of merit rating.

**45.526 Facilities Planning & Design I\* (2 q.h.)**

The planning and designing of industrial plants, in terms of equipment and machinery requirements, plant layout and material flow, utilizing flow charting, scheduling, and laboratory scale models. *Prereq.* 45.508.

**45.531 Facilities Planning & Design II\* (2 q.h.)**

The fundamentals of material handling and related equipments, vehicles, and machinery, including cranes, conveyors, freight elevators, and monorails, with emphasis on analysis of problems, typical cases, and costs, and including engineering economy. *Prereq.* 45.526.

**45.528 Work Measurement (2 q.h.)**

Measurement techniques as applied to development of production and wage standard data, including appropriate incentive plans and directed towards quantity manufacturing, with laboratory use.

**45.530 Standard Data Development (2 q.h.)**

Development of production standards for job shop operations, applying curve, table, equation, nomograph, family and multivariable techniques, and utilizing work sampling methods and laboratory practice.

**45.537 Purchasing I (2 q.h.)**

The fundamental mission and span of responsibility of industrial purchasing in business: the procurement cycle, its principles, methods, and vocabulary.

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\*Upper level Business Administration course—see p. 51.

**45.538 Purchasing II (2 q.h.)**

Techniques of organization of the purchasing function: its systems, source selection and evaluation; the legal environment; quantity and quality determination. *Prereq.* 45.537.

**45.539 Purchasing III (2 q.h.)**

Techniques of creative buying; types of contracts; negotiating and price/cost analysis; purchasing ethics; supplier monitoring and expediting; contract modification and termination. *Prereq.* 45.538.

**45.595 Manufacturing Seminar I\* (2 q.h.)**

Problems of manufacturing operation at the plant manager level, including production economics of specialization, simplification, standardization, diversification, expansion, contraction, or integration, all with pertinent, selected case studies. *Prereq.* 45.625 & 45.637.

**45.596 Manufacturing Seminar II\* (2 q.h.)**

Continued analysis of manufacturing problems, including plant location, layout, materials handling, power maintenance, labor market status, organization and wage policy, all with pertinent, selected case studies. *Prereq.* 45.595.

**45.597 Manufacturing Seminar III\* (2 q.h.)**

Continued analysis of manufacturing problems, including controls of the manufacturing process; product design and development, scheduling, inventory, quality, cost and budgetary controls with applicable cases. *Prereq.* 45.596.

**45.620 Industrial Safety (2 q.h.)**

A study of the organization and administration of a comprehensive accident-prevention program, including analysis of industrial hazards and accidents, corrective actions, and the responsibilities of all management echelons, from the safety engineer to top management.

**45.623 Manufacturing Processes I—Material (2 q.h.)**

Derivation, characteristics, and applications of materials used in industry, such as ferrous, non-ferrous metals, plastics, their mechanical, thermal, electrical, chemical and other properties with an analysis of applications to manufacturing on basis of value engineering criteria.

**45.624 Manufacturing Processes II—Production (2 q.h.)**

Analysis of product design, production processes and material selection in the production and manufacturing of hard goods, including selection of best methods by study of casting, machining, forming, joining, hot and cold working, extrusion, finishing, assembly and related case studies. *Prereq.* 45.623.

**45.625 Manufacturing Processes III—Automation (2 q.h.)**

The analysis of advanced manufacturing processes, including mass production, numeric control, central vs line layout systems, automated systems and related problems, computer controlled equipments and systems, equipment and machinery selection and replacement policies and related case studies. *Prereq.* 45.624.

**45.626 Professional Purchasing Techniques\* (2 q.h.)**

A seminar-type examination of methods of negotiation, use of contract types and incentives which yield improved buyer performance. Price analysis and the development of supplier monitoring and control techniques. *Prereq.* 45.539.

\*Upper level Business Administration course—see p. 51.

**45.627, 45.628 Value Management I, II (4 q.h.)**

An organized technique for challenging costs by analysing a product or method in terms of value, function, and costs, without sacrificing essential quality.

**45.636 Production & Inventory Control I\* (2 q.h.)**

Basic analysis and system-design techniques for controlling production and inventory levels, emphasizing cost reduction, and including inventory investment, economic order quantity, make or buy decisions, and warehousing.

*Prereq.* 45.640.

**45.637 Production & Inventory Control II\* (2 q.h.)**

Aspects of intermittent and continuous production, variable demand, machine break point, simulated scheduling, and relationships of planning, scheduling, and dispatching—with mathematical models. *Prereq.* 45.636.

**45.638 Industrial Decision Making I\* (2 q.h.)**

Application of mathematical methods, of management science and quantitative decision-making procedures to practical industrial problems, including stochastic minimistic systems, optimization and models applied to production functions such as inventory process, plant location, layout and maintenance, and equipment selection, replacement and maintenance. *Prereq.* 10.506.

**45.639 Industrial Decision Making II\* (2 q.h.)**

Application of mathematical methods of management science and quantitative decision-making procedures to practical industrial problems, including stochastic systems applied to probability problems, and including application to production scheduling and control, production planning overtime at minimum cost, warehousing, inventory depletion, economic lot size, etc. *Prereq.* 45.638.

**45.640 Industrial Decision Making III\* (2 q.h.)**

Application of mathematical methods of management science and quantitative decision-making procedures to practical industrial problems, including linear systems utilizations, and functional production applications such as: optimal machine loading, production and employment scheduling, seasonal inventory distribution; transportation and transshipment models; maximum profit margin, methods improvements, and determining highest gross-manufacturing program, etc. *Prereq.* 45.639.

### Personnel & Industrial Relations

**45.510 Labor Management Relations I (2 q.h.)**

The American labor movement and labor relations development; collective bargaining issues, policy and practice; public control of industrial relations. *Prereq.* 39.503.

**45.611 Labor Management Relations II (2 q.h.)**

Continuation of I. The economic and political impact of bargaining power on labor markets, employment, wages, and income. *Prereq.* 45.510.

**45.511 Human Relations in Organizations I (2 q.h.)**

An introduction to human problems of the work environment: motivation, employee participation; formal and informal organizations; and leadership patterns. *Prereq.* 19.503.

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\*Upper level Business Administration course—see p. 51.

**45.512 Human Relations in Organizations II (2 q.h.)**

A continuation of Human Relations I; the processes of communication, interviewing, counseling, appraisal of performance, and the accomplishment of change. Special employment groups and overview of the individual in his organization. *Prereq.* 45.511.

**45.641 Human Relations in Organizations (intensive) (4 q.h.)**

An introduction to human problems of the work environment: motivation, employee participation; formal and informal organizations; and leadership patterns. The processes of communication: interviewing, counseling, appraisal of performance, and the accomplishment of change. Special employment groups and overview of the individual in his organization. Not open to students who have taken 45.511, 45.512. *Prereq.* 19.503.

**45.513 Personnel Management I (2 q.h.)**

Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; personnel policies, benefits, and reports.

**45.514 Personnel Management II (2 q.h.)**

Principles and techniques of training, the psychology of learning, meeting training needs, principles and practices of organizing training activities. *Prereq.* 45.513.

**45.515 Personnel Management III (2 q.h.)**

Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employees' attitudes; employee grievances; administering company policies, developing work interest. *Prereq.* 45.514.

**45.607 Personnel Management (intensive) (6 q.h.)**

Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; personnel policies, benefits, and reports. Principles and techniques of training; the psychology of learning; meeting training needs; principles and practices of organizing training activities. Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employees' attitudes; employee grievances; administering company policies, developing work interest. Not open to students who have taken 45.513, 45.514, 45.515.

**45.517 Techniques of Employee Selection\* (2 q.h.)**

Recruitment, selection, and placement techniques including interviewing, employment testing, and examining. *Prereq.* 45.515. Offered in Spring Quarter

**45.518 Wage and Salary Administration\* (2 q.h.)**

Wage and salary determination; merit and incentive plans; wage and salary structure; compensation methods; impact on employer-employee relations in the economy. *Prereq.* 39.503, 45.503. Offered in Fall Quarter

**45.521 Employee Benefits\* (2 q.h.)**

Private and public programs directed to job and worker income security; unemployment compensation, training and employment services; private guaranteed income; retirement pension plans and disability; group insurance. *Prereq.* 39.503. Offered in Winter Quarter

\*Upper level Business Administration course—see p. 51.

**45.545 Law of Employment Standards\* (2 q.h.)**

The minimum-wage laws—state and federal—and laws on employment practices, administrative and enforcement procedures, employment provisions of the 1964 Civil Rights Act, and of state anti-discrimination laws. *Prereq.* 45.611.

Offered in Fall Quarter

**45.546 Law of Employment Conditions\* (2 q.h.)**

The Labor Management Reporting and Disclosure Act, the Social Security Act, the Massachusetts Employment Security Act, The Massachusetts Workmen's Compensation Act, veterans' reemployment rights. *Prereq.* 45.611.

Offered in Winter Quarter

**45.548 Law of Labor Management Relations\* (2 q.h.)**

The legal framework for collective bargaining, the impact of the anti-trust laws on labor unions, injunctions in labor disputes, the Railway Labor Act, the National Labor Relations Act, the Labor-Management Relations Act. *Prereq.* 45.611.

Offered in Spring Quarter

**45.553 The Labor Agreement\* (2 q.h.)**

Labor contracts: component clauses, grievance analysis, and arbitration procedures. Case studies in labor-management relations affected by such clauses. *Prereq.* 45.611

Offered in even-numbered years; Winter Quarter

**45.556 Negotiations, Mediation, Arbitration\* (2 q.h.)**

The bargaining process; preparation and negotiation of agreements; mediation, fact-finding, arbitration, other alternatives to the strike. *Prereq.* 45.611.

Offered in odd-numbered years; Spring Quarter

**45.557 International Labor Movements\* (2 q.h.)**

Historical treatment of American labor union development and theories of labor organization; relation of labor and government, American, European, and Latin-American labor organization and institutions; international labor organizations. *Prereq.* 45.611.

Offered in even-numbered years; Fall Quarter

**45.560 Seminar on Labor Issues\* (2 q.h.) For Seniors Only**

An advanced discussion of current labor-management issues; policy as to disputes, wage guidelines, public employees' unions, professionals, etc. *Prereq.* 45.546, 45.548, 45.553.

Offered in odd numbered years; Fall Quarter

### Quality Control

**45.536 Principles of Material Inspection (2 q.h.)**

An operating and technical-level course involving mensuration, need and function of inspection and specifications; basic principles and techniques of measurement; various methods and equipment used for gauging and measuring; special measuring and inspection problems.

**45.561 Statistical Quality Control I (2 q.h.)**

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. *Prereq.* 39.513.

\*Upper level Business Administration course—see p. 51.

**45.562 Statistical Quality Control II (2 q.h.)**

Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. *Prereq.* 45.561.

**45.563 Management of Quality Control (2 q.h.)**

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost; the idea of total quality control; measurement of the costs of quality; development of a co-ordinated program of improvement, organizing for diagnosis the defect causes.

**45.608 Quality Control (intensive) (6 q.h.)**

Description and practical application of the basic statistical quality-control methods for quality assurance, quality control, and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. The application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Not open to students who have taken 45.561, 45.562, 45.563. *Prereq.* 39.513.

**45.565 Industrial Experimentation I\* (2 q.h.)**

Modern small sample techniques are applied to industrial problems. Use of statistical inference to make estimates and set confidence intervals of key characteristics of production lots and processes; design of single and multiple factor experiments; tests of significance; analysis of variance. *Prereq.* 39.513.

**45.566 Industrial Experimentation II\* (2 q.h.)**

Tests of significance, analysis of variance; correlation techniques; experimental design; balancing and randomizing techniques; factorial designs; nested designs; Latin square; random balance/multiple-balance. *Prereq.* 45.565.

**45.633 Advanced Quality Control I\* (2 q.h.)**

Detailed study of specialized techniques used in defect-cause diagnosis and problem analysis. Complete analysis of process capability; the multi-vari chart; pictograms; the span plan method. *Prereq.* 45.562.

**45.634 Advanced Quality Control II\* (2 q.h.)**

Continuation of Advanced Quality Control I with special emphasis on design of control plans for process quality control and special cases of product acceptance. *Prereq.* 45.624.

## Law

**45.541 Law I\* (2 q.h.)**

**CONTRACTS:** Nature, kinds, and formation of contracts; essential elements; interpretation of contracts.

\*Upper level Business Administration course—see p. 51.



**45.542 Law II\* (2 q.h.)**

AGENCY: Nature, formation, and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority.

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. *Prereq.* 45.541.

**45.543 Law III\* (2 q.h.)**

NEGOTIABLE INSTRUMENTS: Bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge.

**45.643 Law (intensive)\* (6 q.h.)**

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts.

AGENCY: Nature, formation, and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority.

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer.

NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; liabilities and defenses of parties; procedure upon dishonor; discharge.

BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. Not open to students who have taken 45.541, 45.542, 45.543.

## Management Information Systems

**45.570 Electronic Data Processing I (2 q.h.)**

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts.

**45.571 Electronic Data Processing II (2 q.h.)**

A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals.

*Prereq.* 45.570.

**45.572 Electronic Data Processing III (2 q.h.)**

A presentation of COBOL, FORTRAN and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. *Prereq.* 45.571.

**45.648 Electronic Data Processing (intensive) (6 q.h.)**

An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL, FORTRAN, and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. Not open to students who have taken 45.570, 45.571, 45.572.

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\*Upper level Business Administration course—see p. 51.

**45.573 Basic Computer Programming (2 q.h.)**

Fundamentals of business application programming: Introduction to COBOL, Common Business Oriented Language, adopted as standard business programming language of EDP industry. Principles of flowcharting. Programs prepared by student are run and checked out using University's Computation Center computer. *Prereq.* 45.572.

**45.574 Computer Programming for Business I (2 q.h.)**

Programming in COBOL presented in more detail. Business data processing functions of editing, file updating, report writing are illustrated and implemented in programs prepared by students and run on University's computer. Programming involving punched card input, output, line printer, and magnetic tape peripherals. *Prereq.* 45.573.

**45.575 Computer Programming for Business II (2 q.h.)**

More sophisticated programming techniques as applied to the solution of more complex business application problems. Random access disk file organization and processing is illustrated. Additional features of COBOL compiler language presented and applied in student programs. Computation Center computer employed in running student programs and in developing program checkout and debugging techniques. *Prereq.* 45.574.

**45.644 Basic Computer Programming and Computer Programming for Business (intensive) ( q.h.)**

Fundamentals of business application programming: Introduction to COBOL, Common Business Oriented Language, adopted as standard business programming language of EDP industry. Principles of flowcharting. Programs prepared by student are run and checked out using the University's Computation Center computer. Programming in COBOL presented in more detail. Business data processing functions of editing, file updating, report writings are illustrated and implemented in programs prepared by students and run on the University's computer. Programming involving punched card input, output, line printer, and magnetic tape peripherals. Not open to students who have taken 45.573, 45.574, 45.575. *Prereq.* 45.572.

**45.577 Data Systems Administration (2 q.h.)**

The major phases involved in the study and detailed planning for the effective use of data processing equipment and management sciences in meeting the information needs of business are presented, including the analysis of company objectives, the feasibility study, the system specifications, equipment selection, and the implementation of the new system. *Prereq.* 45.572.

Offered Fall Quarters only

**45.578 Business Data Processing Applications I (2 q.h.)**

The systems considerations of a variety of applications are presented including input/output techniques using returnable media, communications; alternative approaches to updating of files; techniques for control and checking; time sharing through the technique of multi-programming and multi-processing. *Prereq.* 45.577.

Offered Winter Quarters only

**45.579 Business Data Processing Application II (2 q.h.)**

Continuation of 45.578 using additional applications and including a class case study project. *Prereq.* 45.578.

Offered Spring Quarters only

\*Upper level Business Administration course—see p. 51.



**45.583 Computer Programming for Scientific Applications I\* (2 q.h.)**

Designed to provide the student with a working knowledge of FORTRAN, the modern problem oriented computer language. Enables the professional to understand the use of a computer in solving problems in business, mathematics, and the social and physical sciences by being introducing him to problems in selected applications, and illustrating use of FORTRAN in finding solutions. *Prereq.* 45.572.

**45.683 Computer Programming for Scientific Applications II\* (2 q.h.)**

The course provides the student with practical experience in the use of FORTRAN in solving significant problems in business, mathematics, and the social and physical sciences. Problems of sufficient complexity, requiring small team approaches, will be used to allow the student to actively participate in the various steps necessary to analyze, define, document, and solve the problem using FORTRAN. *Prereq.* 45.583.

**45.586 System Design and Techniques I (2 q.h.)**

Introduction to system concepts, system department organization, forms design, systems controls, and manuals. *Prereq.* 45.503 or 45.572.

**45.587 System Design and Techniques II (2 q.h.)**

Development of system techniques through lectures and case studies, including work simplification, work measurement, flow charting, system cost estimating, and system development. *Prereq.* 45.586.

**45.588 System Design and Techniques III (2 q.h.)**

Application of system techniques through extensive use of case studies covering the full spectrum of system development and design. *Prereq.* 45.587.

**45.589 Advanced Business System Design I\* (2 q.h.)**

Introduction to total computer based system concepts, resource management, functional data flows, information feedback process, and major design criteria. *Prereq.* 45.588.

**45.590 Advanced Business System Design II\* (2 q.h.)**

Detailed analysis of a manufacturing company's business system design, focusing on data base design and subsystem relationships between order entry, production control, and inventory control. *Prereq.* 45.589.

**45.591 Advanced Business System Design III\* (2 q.h.)**

Management information system design, including the impact of advanced capabilities such as data communication, on-line file storage, and simulation on the design and system approach. *Prereq.* 45.590.

**45.592 Advanced Computer System Techniques I\* (2 q.h.)**

On-line data communication systems covering the range of services available, remote input and output devices, techniques of control, and application examples. *Prereq.* 45.591.

**45.593 Advanced Computer System Techniques II\* (2 q.h.)**

On-line mass storage devices, data base design, and file retrieval techniques. Real-time input-output techniques including visual and graphic displays. *Prereq.* 45.592.

\*Upper level Business Administration course—see p. 51.

**45.594 Advanced Computer System Techniques III\* (2 q.h.)**

Time sharing system concepts, design, and languages. Application of on-line and time sharing system techniques through case studies and field trips. *Prereq.* 45.593.

**45.616 Government Data Processing Applications I (2 q.h.)**

Discusses the basic role of data processing in the current governmental activities in education (including computer assisted instruction), health (including patient care), welfare (including urban planning), information (including graphic storage and retrieval systems) through description of scientific advanced systems and equipment. *Prereq.* 45.572.

**45.653 Government Data Processing Applications II (2 q.h.)**

Describes principal applications and specific advanced system designs and equipment which have been employed successfully by various levels of government in the fields of public administration, planning, finance, law enforcement and judicature, communication, and integrated information bases. *Prereq.* 45.616.

**45.617 Advanced Computer Programming I\* (2 q.h.)**

Organization, representation, and processing of data internally within the computer. Fundamentals of assembly language programming as applied to business application problems. Looping, instruction modification, indexed, indirect addressing, and other programming techniques. Student program preparation and checkout utilizing University's computer system. *Prereq.* 45.575.

**45.618 Advanced Computer Programming II\* (2 q.h.)**

Assembly language programming of more complex business problems. Sub-routines and macros. Input/output routines, report generators, and other utility routines. Operating systems, monitors and multi-program processing are introduced. Business problems analyzed, flowcharted, programmed, and debugged on University's computer by students. *Prereq.* 45.617.

**45.619 Advanced Computer Programming III\* (2 q.h.)**

Programming of sophisticated computer system applications. File organization, indexing, and randomizing techniques for mass memory. Introduction to data communications. On-line and real-time processing. Applications of inquiry-response data collection and distribution are illustrated and applied. *Prereq.* 45.618.

**45.630 Introduction to Operations Research (2 q.h.)**

Decision making under uncertainty; integration of classical statistics and decision theory with Bayesian concepts; decision tree analysis; preference curves.

**45.631 Operations Research Applications I (2 q.h.)**

Mathematical programming; linear programming graphical, vector, simplex, and transportation methods; the dual; degeneracy; integer programming; non-linear programming; dynamic programming.

**45.632 Operations Research Applications II (2 q.h.)**

Special topics including model building, queuing theory, simulation, Pert-CPM, and game theory.

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\*Upper level Business Administration course—see p. 51.

**45.655 Auditing Data Processing Applications I (2 q.h.)**

A general presentation of auditing techniques used when auditing typical electronic data processing installations. Functional assignment of duties within an electronic data processing installation. Control over input and output, and over data processing. Methodology of safeguarding record files, both physical and against unauthorized use. *Prereq.* 45.572.

**45.656 Auditing Data Processing Applications II (2 q.h.)**

A continuation of auditing applications when reviewed for internal control, hardware checks, system checks, and audit trail. Auditing around the computer versus through the computer. Using the computer to test the Data Processing system and also the records produced by the computer system. Auditing advanced Data Processing systems. *Prereq.* 45.655.

**45.658 Retailing Data Processing Applications I (2 q.h.)**

Analyzes the unique characteristics of the retail application including high volume of transactions, low unit value, decentralized input, short term employees, multi-level reporting and their effects on the EDP systems requirements in each of the classical areas of the organization. *Prereq.* 45.572.

**45.659 Retailing Data Processing Applications II (2 q.h.)**

Develops the systems considerations of the first quarter further into the requirements of an overall, integrated management information system for retail. *Prereq.* 45.658.

**45.661 Banking Data Processing Applications I (2 q.h.)**

Reviews the major functions of banking, deposit loan and money and analyzes their uniqueness from an EDP point of view in the applications of demand deposit accounting, commercial and installment loan accounting, bank credit card accounting, and credit file maintenance. *Prereq.* 45.572.

**45.662 Banking Data Processing Applications II (2 q.h.)**

Expands on first quarter by analyzing mortgage accounting, savings accounting, mutual fund and stock transfer accounting, personal trust accounting, new remote terminals and the development of management information systems for commercial banks and thrift institutions. *Prereq.* 45.661.

**45.664 EDP in Property and Casualty Insurance I (2 q.h.)**

A survey of the various functions unique to property and casualty industry and the role of data processing as applied to the particular functions: underwriting, policy production claims, and actuarial. *Prereq.* 45.572.

**45.665 EDP in Property and Casualty Insurance II (2 q.h.)**

Application of the principles surveyed in the first quarter to one or more case studies developing an information system for property and casualty company management. *Prereq.* 45.664.

**45.667 Project Planning and Control (2 q.h.)**

This course employs a systems approach to planning and controlling a work project. Topics to be covered include detailed planning techniques, establishment of functional and individual responsibilities, resource allocation, identifying anticipated benefits, measuring results and effective progress reporting. Students will be expected to actively participate in class workshop sessions. *Prereq.* 45.573.

**45.677 Operating Systems I (2 q.h.)**

Survey type course—describing operating systems and investigating the full range of systems services available under computer operating systems. Special emphasis is placed on their value as tools for developing management information. (Note: This quarter could stand alone as management tool for decision-making.) *Prereq.* 45.575.

**46.678 Operating Systems II (2 q.h.)**

Specific software covered will be systems supervisor, data management system, FORTRAN, COBOL, P1/1, and special purpose compilers. Also investigated will be operating systems which accommodate network analysis, Pert systems, simulation packages, and statistical analysis packages. *Prereq.* 45.677.

**45.679 Operating Systems III (2 q.h.)**

Detail analysis on data management systems with specific case studies and development of operating system programs. *Prereq.* 45.678.

**45.680 Computer-Communications Systems Design and Analysis I (2 q.h.)**

Discussion of computer-communications with emphasis on types of devices, communication lines; economic considerations such as line charges, types of lines, etc.—study of design and development considerations involved in a communications program—study of time-sharing programs and how they relate to communications programming. *Prereq.* 45.575.

**45.681 Computer-Communications Systems Design and Analysis II (2 q.h.)**

Discussion of types of communication programs such as information retrieval, message switching, data reception and transmission, and others. Buffering techniques for communications programs. *Prereq.* 45.680.

**45.682 Computer-Communications Systems Design and Analysis III (2 q.h.)**

Case studies in the design and development of several types of computer-communications program. The student will develop flowcharts, systems definition system and program narratives, and documentation of programs pertinent to case studies. Student will checkout communications programs either with terminals or under simulation—(Note: Instructor and student will need hands on computer time for this phase of instruction.) *Prereq.* 45.681.

**45.668 Peripheral Systems Techniques I (2 q.h.)**

This course deals with the many peripheral skills and techniques which the modern analyst must employ in his daily activities. Specific areas to be covered include the systems approach to decision-making, interviewing, preparing and presenting proposals to executive management, techniques of documentation. *Prereq.* 45.573. Offered Winter quarters only.

**45.669 Peripheral Systems Techniques II (2 q.h.)**

A continuation of 45.668. This course will cover such topics as the impact of the systems analyst as a trainer; organizational employers of third generation computers; control and systems auditing, and the establishment of data processing standards. *Prereq.* 45.668. Offered Spring quarters only.

**47—REAL ESTATE****47.501 Real Estate Fundamentals I (2 q.h.)**

An introduction to the fundamentals of real estate including basic terminology and various types of purchase contracts. Real estate brokerage and leasing fundamentals in commercial, office, and residential properties will also be explored.

**47.502 Real Estate Fundamentals II (2 q.h.)**

A general examination of real property management with emphasis on the special characteristics of different types of property, along with introduction to valuation of property, including analysis of operating statements. *Prerequisite 47.501 or permission of instructor.*

**47.503 Real Estate Fundamentals III (2 q.h.)**

Real Estate financing will be explored with respect to the various types of institutions involved in the financing of different properties, including interim, permanent, and secondary financing. Specific case studies will also be used. *Prerequisite 47.502 or permission of instructor.*

**47.508 Real Estate Financial Analysis I (2 q.h.)**

Structure and analysis of real estate income and expense statements. Sources of funds, borrowing methods, effects of taxation, rates of return, etc. *Prerequisite 47.503 or permission of instructor.*

**47.509 Real Estate Financial Analysis II (2 q.h.)**

Analysis of risks and problems involved in financing real property with emphasis on use of case studies and problems. Class participation stressed. *Prerequisite 47.508, or permission of instructor.*

**47.511 Fundamental Real Estate Appraisal (2 q.h.)**

A fundamental course in real estate appraisal with emphasis on single- and two- and three-family properties. Analysis of city and neighborhood influences, site valuation, building diagnosis, depreciation, study of the applicable approaches to value, appraisal report preparation. *Prerequisite 47.503 or permission of instructor.*

**47.512, 47.513 Advanced Real Estate Appraisal I & II (4 q.h.)**

An advanced course in the evaluation of residential and income properties. Application of the cost, market, and income approaches to apartment buildings and commercial and industrial developments. Particular emphasis on the various methods of capitalization and residual techniques. Class participation in case studies and problems. *Prerequisite 47.511 or permission of instructor.*

**47.521 Real Estate Development (2 q.h.)**

Analysis of the problems in real estate development using the case method. Emphasis on the risks and opportunities which face developers in the planning, marketing, construction, and financing of apartments, shopping centers, and office buildings. *Prerequisite 47.509 or permission of instructor.*

**47.524 Private Real Estate Law (2 q.h.)**

Elements of a real estate contract and its enforceability; the concept of title; mortgages and their purposes; recording of real estate interests; the landlord and tenant relationship. *Prerequisite 47.503 or permission of instructor.*

**47.525 Public Real Estate Law (2 q.h.)**

This course will focus on zoning, subdivision control, conservation controls, taxation of real estate, rent control, eminent domain, and urban renewal. *Prerequisite* 47.503 or permission of instructor.

**48—TRANSPORTATION & PHYSICAL DISTRIBUTION MANAGEMENT**

**48.501 Transportation Management I (2 q.h.)**

Basic principles of management and organization, evaluation of all transportation modes, and primary concepts of freight classification and rates.

**48.502 Transportation Management II (2 q.h.)**

Study of primary management functions—use of tariffs, routing, document processing, analysis of special carrier services and liabilities, and control of private carrier operations. *Prereq.* 48.501.

**48.503 Transportation Management III (2 q.h.)**

Appraisal of federal transport policy and introduction to factors of physical distribution—inventory control, warehousing, material handling, packaging, and international distribution. *Prereq.* 48.502.

**48.504 Transportation Regulation and Promotion I (2 q.h.)**

Study of the history and content of the Interstate Commerce Act. *Prereq.* 48.503.

**48.505 Transportation Regulation and Promotion II (2 q.h.)**

Examination of administrative law and procedure, the code of ethics and the general rules of practice. *Prereq.* 48.504.

**48.506 Transportation Regulation and Promotion III (2 q.h.)**

Analysis of cases pertinent to the Commerce Clause and comprehensive preparation for the Interstate Commerce Commission Practitioners Examination. *Prereq.* 48.505.

**48.511 Railroad and Ocean Transportation I (2 q.h.)**

Consideration of railroad industry's contribution (past, present and future) toward the development and economy of the nation, based on analysis of railroad statistics depicting growth, changes, technological improvements and effects of competing modes of transport and existing government regulations.

**48.512 Railroad and Ocean Transportation II (2 q.h.)**

Concentration on day to day developments in the industry resulting from pending and accomplished mergers and various programs for the growth of the railroad industry. *Prereq.* 48.511.

**48.513 Railroad and Ocean Transportation III (2 q.h.)**

Role of ocean transportation in facilitating exports and imports with emphasis on containerization, land bridges, and port facilities, promotion, management and labor. *Prereq.* 48.512.

**48.517 Motor Carrier Management I (2 q.h.)**

Physical handling and organization of freight with regard to driver training; dispatch and administrative procedures involved in movement of freight and driver control.

**48.518 Motor Carrier Management II (2 q.h.)**

Management organization for insurance, financing, traffic, and accounting procedures. *Prereq.* 48.517.



**48.519 Motor Carrier Management III (2 q.h.)**

Leasing and management of private industrial fleets—legality of operations, development of service efficiency, and cost reduction. *Prereq.* 48.518.

**48.521 Physical Distribution Management I\* (2 q.h.)**

The what and why of physical distribution management—how much should you know? *Prereq.* 48.506; 48.526.

**48.522 Physical Distribution Management II\* (2 q.h.)**

The what and why of systems approach, total cost concepts, and tradeoffs. *Prereq.* 48.521.

**48.523 Physical Distribution Management III\* (2 q.h.)**

How do computers, inventory control, warehouses, measurement, plant location, and the organization chart fit in? *Prereq.* 48.523.

**48.524 Transportation Economics and Rate Making I\* (2 q.h.)**

The macro-economic and micro-economic aspects of the transportation industry with particular emphasis on the aggregate transportation plant: the role of transportation as an economic function; and the production of, demand for, and pricing of the transportation service. *Prereq.* 48.506.

**48.525 Transportation Economics and Rate Making II\* (2 q.h.)**

An analysis of the purpose and status of transportation tariffs and the influence and effect of government rules and statutes thereon. *Prereq.* 48.524.

**48.526 Transportation Economics and Rate Making III\* (2 q.h.)**

An examination of the leading cases decided by I.C.C. and the federal courts leaning on interpretation of tariff matters accomplished by practical problems. *Prereq.* 48.525.

**48.541 Air Transportation Management I (2 q.h.)**

Economics and regulation of Civil Aeronautics Board certificated commercial passenger aviation—including routes, schedules, operations, pricing, cost analysis and financing.

**48.542 Air Transportation Management II (2 q.h.)**

Similar analysis as 48.541 for cargo operations. *Prereq.* 48.541.

**48.543 Air Transportation Management III (2 q.h.)**

Economics and regulation of general aviation including analysis of corporate, air taxi, and third level operations. *Prereq.* 48.542.

**48.544 Urban Transportation I (2 q.h.)**

Analysis of highways and public transportation systems in moving large numbers of people in congested areas at peak periods.

**48.545 Urban Transportation II (2 q.h.)**

Appraisal of existing transit services, fares, labor relations, and operating policies in eastern Massachusetts. *Prereq.* 48.544.

**48.546 Urban Transportation III (2 q.h.)**

Study of comprehensive planning and more effective transit marketing for an enlarged and more useful transit system. *Prereq.* 48.545.

## 50—EDUCATION FOUNDATIONS

**50.111 Social Science I (3 cl., 3 q.h.)**

Cultural anthropology and education. Theories and concepts in cultural anthropology will be studied with primary emphasis on their relevance to informal and formal aspects of educational processes. Considerable attention will be devoted to the study of cross cultural materials in order to understand the educational process in different cultural milieus.

**50.112 Social Science II (3 cl., 3 q.h.)**

Sociology and education. Involves sociological analysis of the educational enterprise in the United States and other technologically advanced societies, including consideration of the socialization process, the formation of youth cultures, and the function of the schools in these contexts. Attention will be given to the study of the effects of stratification, ethnic, and racial factors on educational institutions, education and social change, and the school as a social system.

**50.113 Social Science III (3 cl., 3 q.h.)**

Intergroup relations and education. Examination of theoretical and empirical materials relative to the problem of intergroup relations and prejudice. Particular attention will be paid to the role of education in the reduction of intergroup conflict.

**50.121 Human Development and Learning I (4 cl., 4 q.h.)**

Developmental processes from prenatal life up to adolescence, theories of learning and personality, with research and case material covering major aspects of psychological development.

**50.131 Human Development and Learning II (4 cl., 4 q.h.)**

Continuation of Human Development and Learning I. Significant aspects of adolescence—physical, social, and psychological factors as they influence adolescent behavior. *Prereq.* 50.121.

**50.141 Measurement and Evaluation (4 cl., 4 q.h.)**

The fundamentals of measurement; basic statistical concepts and techniques used; evaluation of standardized and teacher-made tests. *Prereq.* *Meth and Mat. course in maj. field.*

**50.151 Backgrounds of American Education (4 cl., 4 q.h.)**

Historical and philosophical foundations of American education beginning with old-world origins; development of American schools and educational thought from the colonial period to the present with emphasis on major current issues in education. *Prereq.* 50.141.

## 51—EDUCATION — INSTRUCTION

**51.135 Analysis of Teaching and Educational Process (4 cl., 4 q.h.)**

The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching function. *Prereq.* 50.131.



**51.143 Methods and Materials of Teaching English (4 cl., 4 q.h.)**

An introduction to the structure and functions of language as they apply to the teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media. *Prereq.* 51.135.

**51.151 Student Teaching with Related Seminar (8 q.h.)**

A University-arranged practicum of observation and teaching in schools within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. *Prereq.* Permission of adviser.

**54—EDUCATION — READING****54.126 Teaching Reading in Secondary Schools (4 cl., 4 q.h.)**

For English and social studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course.

**86—HEALTH CARE SERVICES**

*Courses open to all students*

**86.502 Hospital Law and Ethics (2 q.h.)**

A study of important legal principles and rulings of importance to medical administrative personnel and others. Brief introduction to interpersonal ethics in patient care.

**86.503 Emergency Procedures and Accident Prevention (2 q.h.)**

First aid and the emergency care of injuries and medical emergencies pending the arrival of professional assistance. Emphasis on safety and accident prevention throughout the course.

**86.504 Foundations of Medical Science I (2 q.h.)**

Study, primarily through physicians' lectures, of major disease problems in our society and modes of treatment. Intended for the non-medical student who wishes an understanding of the problems faced by the physician in daily practice, to facilitate communication between medical and non-medical members of the health team. Discusses organized care, diagnosis, and treatment.

**86.505 Foundations of Medical Science II (2 q.h.)**

A continuation of 86.504, emphasizing reproduction, birth, pediatrics. Dental health and dermatology also discussed.

**86.506 Foundations of Medical Science III (2 q.h.)**

A continuation of 86.505. Heart disease; cancer; stroke; blood and lymphatic diseases; accidents; musculo-skeletal, respiratory, and gastro-intestinal diseases.

**86.512 Foundations of Medical Science (3 q.h.)**

Combines the content of 86.504 and the first half of 86.505. Offered for day programs only.

**86.513 Foundations of Medical Science (3 q.h.)**

Combines the content of the second half of 86.505 and 86.506. Offered for day programs only.

**86.574 Health, Disease & Disability I (3 q.h.)**

A study of the major disease or disability states and their impact on human physiology and psychology. Social and individual response to these states. Lectures, demonstrations, field visits. Part I emphasizes medical areas. *Prereq.* 86.506 or 86.513, and 18.306, 18.309, or 18.326.

**86.575 Health, Disease & Disability II (3 q.h.)**

A continuation of 86.574. Part II emphasizes surgical areas. *Prereq.* 86.574.

**86.576 Health, Disease & Disability III (3 q.h.)**

A continuation of 86.575. Part III emphasizes specialty areas not covered in Parts I and II. *Prereq.* 86.575.

**86.507 Medical Terminology I (2 q.h.)**

An intensive introduction to medical terminology including stems, prefixes, and suffixes. Practice in usage.

**86.508 Medical Terminology II (2 q.h.)**

A more extensive and in-depth consideration of medical terminology. Intended for the medical records specialist. *Prereq.* 86.507.

**86.509 Medical Terminology (4 q.h.)**

Combines the content of 86.507 and 86.508 for day programs only.

**86.511 Personal & Community Health (2 q.h.)**

Principles of personal health and healthful living and their application to interpersonal relationships and community life. Discusses important contemporary health problems.

**86.515 Home Health Care (3 q.h.)**

A combination lecture and field training program designed to provide the technical skills required for the provision of effective community home health care. *Prereq.* permission.

**86.516 Principles and Practice of Community Mental Health (3 q.h.)**

The course will provide a rudimentary understanding of the basic principles and techniques of modern community mental health practice. Supervised clinical experience will be provided.

**86.521 Public Health I (2 q.h.)**

Principles of public health. Organization of health agencies and services.

**86.522 Public Health II (2 q.h.)**

Continuation of 86.521, emphasizing community organization for health services. *Prereq.* 86.521.

**86.524 Methods & Materials in Public Health Education (2 q.h.)**

An introduction to health education in the public health context. *Prereq.* 86.511 or 86.522.

**86.541 Medical Care & Current Social Problems I (2 q.h.)**

Seminar course discussing society's organization to deliver medical care services. *Prereq.* permission.

**86.542 Medical Care & Current Social Problems II (2 q.h.)**

A continuation of 86.541 discussing topics identified in the first part of the course as matters of great concern in the field of medical care. *Prereq.* 86.541.

**86.543 Medical Care & Current Social Problems III (2 q.h.)**

A continuation of 86.542, examining current professional literature of medical care. *Prereq.* 86.542.

**86.569 Medical Technology Education Seminar (2 q.h.)**

A series of seminars designed to prepare the practicing technologist for effective clinical instruction.

**86.570 Medical Technology Administration Seminar (2 q.h.)**

A presentation of the principles of personnel and laboratory management, medical and legal aspects of medical technology, and quality control.

**86.571 Long-Term Care Administration I (2 q.h.)**

The organization of care for the long-term acute and chronically ill patient. Goals and purposes of nursing homes; types. Budgeting, financing, administration, and services.

**86.572 Long-Term Care Administration II (2 q.h.)**

Nursing units; role of the physician. Nursing home-hospital relationships. Therapies. Social work. *Prereq.* 86.571 or permission.

**86.573 Long-Term Care Administration III (2 q.h.)**

Design of long-term care facilities, capital funding, staffing, budgeting, public relations. *Prereq.* 86.572 or permission.

**86.577 Geriatric Care I (2 q.h.)**

The nature and problems of aging—individual and social considerations. *Prereq.* 86.573.

**86.578 Geriatric Care II (2 q.h.)**

The care of elderly patients in home, community, and institutions. *Prereq.* 86.577.

**86.579 Geriatric Care III (2 q.h.)**

Seminar course on the provision and improvement of services to the elderly. *Prereq.* 86.578.

**86.581 Hospital Organization & Management I (2 q.h.)**

The history and development of hospitals—the contemporary hospital system. Different types of hospital organizations. For middle-management personnel.

**86.582 Hospital Organization & Management II (2 q.h.)**

A continuation of 86.581; hospital departments, their organization, functions, and interrelationships. For middle-management personnel. *Prereq.* 86.581.

**86.583 Hospital Organization & Management III (2 q.h.)**

A continuation of 86.582. New methods of patient care. For middle-management personnel. *Prereq.* 86.582.

*Courses open to Medical Record students only.*

**86.554 Medical Records Science I (4 q.h.)**

Introduction to medical records, history of the record, organization and content. Directed laboratory practice for proficiency. *Prereq.* 80 q.h. credit incl. 18.326, 86.504 and 86.508 or 86.509.

**86.555 Medical Records Science II (4 q.h.)**

A continuation of 86.554, also discussing abstracting records and preparing reports. Directed laboratory practice for proficiency. *Prereq.* 86.554.

**86.556 Medical Records Science III (4 q.h.)**

A continuation of 86.555, also discussing storage and preservation of records. Directed laboratory practice for proficiency. *Prereq.* 86.555.

**86.562 Medical Records Science (6 q.h.)**

Combines the content of 86.554 and the first half of 86.555. For full-time day students. *Prereq.* full-time student, "Middler" status *Prereq.* 86.509 and 86.513 or equivalent plus human anatomy.

**86.563 Medical Records Science (6 q.h.)**

Combines the content of the second part of 86.555 and 86.556. For full-time day students. *Prereq.* 86.562 or 86.555, full-time status.

**86.557 Medical Records Science IV (4 q.h.)**

Analysis and coding of medical records. Procedures in special areas. Lab practice. *Prereq.* 86.556 or 86.563.

**86.558 Medical Records V (4 q.h.)**

New theories and procedures in medical record practice. Lab practice. *Prereq.* 86.557.

**86.551 Organization of the Medical Record Department I (2 q.h.)**

Principles and practices essential to the effective organization of a medical records service. *Prereq.* 86.556 or 86.563.

**86.552 Organization of the Medical Record Department II (2 q.h.)**

Continuation of 86.551. Professional relationships; standard procedures. *Prereq.* 86.551.

**86.553 Organization of the Medical Record Department III (2 q.h.)**

Continuation of 86.552. Personnel and management of the department. *Prereq.* 86.552.

**86.560 Organization of the Medical Record Department (3 q.h.)**

Combines the content of 86.551 and first half of 86.552 for full-time medical records students. *Prereq.* 86.556 or 86.563, full-time status.

**86.561 Organization of the Medical Record Department (3 q.h.)**

Combines the content of second half of 86.552 and 86.553 for full-time medical records students. *Prereq.* 86.560 or 86.562.

**86.559 Current Issues in Medical Records Administration (2 q.h.)**

Seminar course discussing new problems presented by changing patterns of medical care. Review of the current literature. *Prereq.* permission.

**86.564 Seminar in Medical Records Science (Open only to full-time medical records majors during senior year) (3 q.h.)**

Class discussion of experiences in the clinical setting. Assigned outside projects. Supervised practice.

**86.544 Medical Records Field Practice & Research Seminar (3 q.h.)**

Full-time field assignment in affiliated hospital medical record departments with research assignments and regularly scheduled seminar and conference sessions. *Prereq.* 86.558 & permission.

*Courses open to Respiratory Therapy Students only.*

**86.591 Introduction to Respiratory Therapy I (3 q.h.)**

The development and understanding of the respiratory therapist's role as a member of the health care profession. Functions, legal and ethical rights and responsibilities. A concise survey of the normal structures and functions of the human body with particular emphasis on the organs of respiration and circulation and the principle of oxygen transport and tissue metabolism. *Prereq.* permission.

**86.592 Introduction to Respiratory Therapy II (3 q.h.)**

The basic outline includes microbiological principles and techniques. Spread of disease and theory of sterilization as it relates to humidification, nebulization, vaporization, intermittent positive and expiratory positive pressure breathing techniques. Theory and classification of nebulizers. Humidifiers and ventilation. *Prereq.* 86.591.

**86.593 Introduction to Respiratory Therapy III (3 q.h.)**

Therapy and procedures in chest physiotherapy. Resuscitation, artificial ventilation. Mechanics of breathing. Pulmonary function and pharmacology for respiratory therapists. *Prereq.* 86.592.

**86.594 Procedures in Respiratory Therapy I (4 q.h.)**

Pathology and physiology of medical, surgical, obstetrical, thoracic, neurosurgical, and pediatric disease enteties. *Prereq.* 86.593.

**86.595 Clinical Internship (4 q.h.)**

Supervised clinical practice at primary teaching hospitals. *Prereq.* 86.664.

**86.596 Procedures in Respiratory Therapy III (4 q.h.)**

Application and procedures in emergencies, obstetrics, pediatrics, and general thoracic and neuro-surgery. *Prereq.* 86.665.

**86.597 Procedures in Respiratory Therapy IV (4 q.h.)**  
Applied cardio-pulmonary physiology. *Prereq.* 86.666.

**86.598 Procedures in Respiratory Therapy V (4 q.h.)**  
Principles and practices involved in the supervision and administration of a respiratory therapy department. Intensive review for professional qualification in oral and written examinations. *Prereq.* 86.567.

## 94—LAW ENFORCEMENT

**94.501 Administration of Justice (2 q.h.)**  
The roles in society of the judiciary and the legislature, surveying their inter-relationship with law enforcement agencies as arms of the executive at all levels of government.

**94.502. Criminal Law (2 q.h.)**  
Constitutional and statutory considerations, elements of a crime, law of arrest, criminal responsibility, entrapment, defenses.

**94.503 Evidence and Court Procedure I (2 q.h.)**  
Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof.

**94.504 Evidence and Court Procedure II (2 q.h.)**  
Competency, consideration of witnesses, laws of search and seizure, court procedures, moot court exercises. *Prereq.* 94.503.

**94.505 Human Rights in Corrections (2 q.h.)**  
Consideration of the special practices and problems in the protection of human rights in the institutional environment; legal and practical aspects.

**94.506 Basic Statistics in Corrections (2 q.h.)**  
Introduction to basic statistical information; procedures and operations relating to correctional areas; interpretation of records and research; data on specialized services; fiscal, budgetary, and operational statistics.

**94.507 Correctional Counseling (2 q.h.)**  
Basic concepts and principles of counseling; individual and group therapy carried on in the correctional field and institutional services; case study and projects.

**94.508 Criminal Investigation and Case Preparation I (2 q.h.)**  
Crime scene procedures; collection and preservation of evidence; general investigative techniques; methods of gathering evidence and information.

**94.509 Criminal Investigation and Case Preparation II (2 q.h.)**  
Consideration of particular crimes, including arson, sexual offenses, larceny, burglary, robbery, forgery and homicide; conduct of raids; surveillance and undercover operations. *Prereq.* 94.508.

**94.510 Criminal Investigation and Case Preparation III (2 q.h.)**

Methods of preparing a case for court; the investigator in court; specialized scientific methods; practical exercises, involving techniques of prosecution and cross examination. *Prereq.* 94.509.

**94.511 Civil Law in Criminal Justice (2 q.h.)**

Civil matters, such as conversion, bailment, master-servant relations, domestic relations and contracts, which should be known to and distinguished by law enforcement personnel. *Prereq.* 94.502.

**94.512 Comparative Police Systems (2 q.h.)**

A study of existing police systems in other jurisdictions; examination of the organization, administration and practices in police agencies in the United States, Europe, and the United Kingdom. *Prereq.* 94.572.

**94.513 Introduction to Industrial Security (2 q.h.)**

The historical, philosophical, and legal basis of security; a survey of administrative, personnel, and physical aspects of the security field.

**94.514 Interviews and Interrogations I (Formerly titled Police Interrogation I.) (2 q.h.)**

Interviewing of victims, witnesses, informants, and complainants; demonstration, study, discussion, and practice of techniques and procedures.

**94.515 Interviews and Interrogations II (Formerly titled Police Interrogation II.) (2 q.h.)**

Techniques for legally acceptable questioning of suspects and persons in custody; laws governing interrogation practices; demonstrations, class exercises and assigned projects. *Prereq.* 94.514.

**94.516 Security Administration (2 q.h.)**

Administration, organization and operations of security and protection units; personnel selection; relationships of business and industry with governmental units.

**94.517 Advanced Correctional Practices I (2 q.h.)**

Diagnosis and treatment of the drug addict and the alcoholic offender at both juvenile and adult levels; a study of these and related kinds of personal self-abuse as to causation and treatment. *Prereq.* 94.553.

**94.518 Advanced Correctional Practices II (2 q.h.)**

Case studies of persons confined as to their past and present environment and relationships; consideration of purposeful resolves or regressions. *Prereq.* 94.517.

**94.519 Advanced Correctional Practices III (2 q.h.)**

Evaluation of correction-psychiatric facilities for the disordered offender, including the aggressive, the assaultive, and the violent subject. *Prereq.* 94.518.

**94.520 Traffic Law Enforcement I (2 q.h.)**

A study of traffic accident prevention, investigation, and procedures; laws, rules, and regulations relative to traffic enforcement.



**94.521 Traffic Law Enforcement II (2 q.h.)**

A study of traffic law enforcement techniques, including such technical aspects as the formulas governing the estimation of speed and the use of equipment.

**94.522 Traffic Law Enforcement III (2 q.h.)**

Selective assignment and enforcement; traffic surveys and engineering aspects; safety education; evaluation of current programs and discussion of projected goals. *Prereq.* 94.521.

**94.523 The Law and Institutional Treatment (2 q.h.)**

The process of law from arrest of offender through release in its relation to correctional principles and practices; functions of police, defense, prosecution, and courts; legal documents related to commitment.

**94.524 Comparative Correctional Systems (2 q.h.)**

A study of correctional systems and methods in selected jurisdictions; examination of the organization, administration, and practices in United States and foreign countries. *Prereq.* 94.544.

**94.525 Law Enforcement Identification and Records I (2 q.h.)**

Records systems and utilization; survey of forms, files, procedures, standards and uniformity; concentration of theoretical and practical applications.

**94.526 Law Enforcement Identification and Records II (2 q.h.)**

Theories and practices in personal identification; general application of identification principles to and by enforcement personnel; survey and evaluation of new techniques.

**94.527 Law Enforcement Identification and Records III (2 q.h.)**

Historical and current legal considerations of identification and record data; present and future developments in storage and retrieval technology and field applications; practical exercises. *Prereq.* 94.526.

**94.530 Police Public Relations (2 q.h.)**

The principles of sound public relations for the entire police operation; writing, public speaking, conferences, and all news media; consideration of police image and public opinion.

**94.531 Police Community Relations (2 q.h.)**

A survey of the role and function of police in intergroup relations; human relations and minority groups; responsibilities of police with civil rights, civil disorders, and public protection.

**94.532 Research Methods in Criminal Justice (2 q.h.)**

A research project related to some specific police or correctional interest or operation, in consultation with the faculty adviser. Course meets at discretion of the instructor. Project paper required for grade. *Prereq.* 94.531, 94.565, 94.544, or 94.550.



**94.536 The Patrol Function I** (Formerly titled Police Patrol I.) (2 q.h.)

The fundamentals of foot and vehicular patrol; determination of routes and resource allocation; development of qualified personnel for patrol operations.

**94.537 The Patrol Function II** (Formerly titled Police Patrol II.) (2 q.h.)

Stopping methods; transportation of prisoners; survey of equipment; evaluation; procedures for disorders and natural disasters. *Prereq.* 94.536.

**94.541 Introduction to Criminalistics I** (2 q.h.)

A survey of the elements of microscopy, spectroscopy, and chemistry as applied to trace evidence in criminal investigations; responsibilities of technician, investigator, and others.

**94.542 Introduction to Criminalistics II** (2 q.h.)

Toxicology and serology; procedures related to other physical evidence; laboratory demonstrations and practical exercises. *Prereq.* 94.541.

**94.544 The American Correctional System** (2 q.h.)

A critical survey of the correctional field covering probation, institutions, and parole as to historical development, program content, and current problems and needs.

**94.546 Social Deviance I** (2 q.h.)

A consideration of the social problems of social disorganization, mental disorders, drug addiction, alcoholism, suicide, and sexual behavior.

**94.547 Social Deviance II** (2 q.h.)

Continuing consideration of world's population crisis, race and ethnic relations, family disorganization, work and automation, poverty and disrepute, war and disarmament. *Prereq.* 94.546.

**94.549 Treatment of Offenders I** (2 q.h.)

The concept of treatment and corrections; history; classification; training, education and guidance; treatment methods; inmate society; health and social services.

**94.550 Treatment of Offenders II** (2 q.h.)

Therapy, psychiatric and psychological considerations, case studies, evaluation of comparable methods. *Prereq.* 94.549.

**94.551 Correctional Administration I** (2 q.h.)

Correctional processes and services, standards, personnel and principles of management; allocation of resources, training of staff.

**94.552 Correctional Administration II** (2 q.h.)

Study of regular and special programs, volunteers, outside contacts, sentence reduction, discharge planning, work release administration.

**94.553 Correctional Administration III** (2 q.h.)

Types of institutions; compacts; regional concepts; planning, organizing, controlling, and directing corrections; budgeting. *Prereq.* 94.552.

**94.557 Investigative Report Writing (2 q.h.)**

Report content and writing, exercises in accurate terminology and concise reporting, interpretation and evaluation of information, practical report-writing projects.

**94.560 Police Supervision (2 q.h.)**

The police supervisor's role in discipline; interdepartmental relations; problem handling and personnel policies; problems in supervisory relationships; wages, grievances, morale, and safety.

**94.561 Police Work With Juveniles (2 q.h.) (Formerly titled Police Juvenile Methods)**

The role of the police in delinquency prevention with emphasis on theory, administration, control, treatment, confinement, community resources, and relationships with the public and the juvenile court.

**94.565 Seminar in Delinquency Prevention (2 q.h.)**

A survey of delinquent behavior, causation, and delinquency prevention programs; seminar projects for discussion of specific problems and general principles in establishing delinquency prevention services.

**94.567 Probation and Parole Practices I (2 q.h.)**

The probation officer; presentence investigation; conditions of probation; effectiveness, administrative aspects and prediction methods; relationship to community.

**94.568 Probation and Parole Practices II (2 q.h.)**

The parole officer; conditions of parole; supervision; effectiveness; administrative relationships; relationships to community, court and law enforcement agencies; relationships of probationer and parolee to rehabilitative, social, and family services; consideration of recidivism; aftercare.

**94.571 Law Enforcement Management and Planning I (2 q.h.)**

Philosophy and theories of management in law enforcement; studies of organizations from the administrator's viewpoint, including control, efficiency, effectiveness, and discipline.

**94.572 Law Enforcement Management and Planning II (2 q.h.)**

A study of the administration of enforcement and civilian personnel, including selection, recruitment, evaluation and training; interpersonal communication within and among departments; special activities and responsibilities of the administrator.

**94.573 Law Enforcement Management and Planning III (2 q.h.)**

Administrative planning; budgets; management records; relationships with the community and other public officials; evaluation of present and future management systems. *Prereq.* 94.572.

**94.574 Juvenile Corrections I (2 q.h.)**

A study of police, detention, petition, and hearings related to juveniles; juvenile court procedures, philosophy, and terminology; adjudication.

**94.575 Juvenile Corrections II (2 q.h.)**

Social workers, probation officers, judges, psychologists, and psychiatrists with relation to juveniles; institutions; aftercare; prevention. *Prereq.* 94.574.

**94.577 Government Security Programs I (2 q.h.)**

Department of Defense security programs; applicable federal statutes and executive orders; visitor control.

**94.578 Government Security Programs II (2 q.h.)**

Security clearances under appropriate federal directives; handling classified information; automatic time-phased downgrading and declassification.

**94.579 Government Security Programs III (2 q.h.)**

Relations with subcontractors, vendors, and suppliers; the protection of proprietary information; legal and practical protection of sensitive data. *Prereq.* 94.578.

**94.582 Document Control (2 q.h.)**

A detailed study of procedures for handling and control of classified and other sensitive information; a survey of control systems from manual to semi-automated systems using data processing equipment.

**94.583 Industrial Fire Prevention (2 q.h.)**

Principles and practices of fire safety, including organization and management responsibility, property conservation, safeguards for construction, fire control apparatus and functions, engineering and scientific data on fires and related perils.

**94.584 Physical Security I (Formerly titled Plant Protection I.) (2 q.h.)**

The basic foundations for security in industry, banking, transportation, utilities, and other nongovernmental operations; physical requirements and standards.

**94.585 Physical Security II (Formerly titled Plant Protection II.) (2 q.h.)**

Implementation of security; study of inanimate aspects, including alarm and surveillance devices; study of animate aspects of protection. *Prereq.* 94.584.

**94.586 Retail Security (2 q.h.)**

The operation of security departments including functions of mercantile establishments; dishonest employees; shoplifters; management and public relations; receiving, shipping, and warehousing; special laws and procedures.

**94.587 Bank Security Measures (2 q.h.)**

(Formerly titled Security Measures for Financial Institutions.)

An in-depth study of the principles and practices of security measures for banks and other financial institutions and the preparation of rules establishing minimum standards under current federal and state legislation.

**94.591 Seminar in Security (2 q.h.)**

(Formerly titled Seminar in Industrial Security.)

An analysis of current problems in security such as growth patterns, salary structures, training and education, existing weaknesses; field trips, individual study assignments, and required oral and written reports.

**94.593 Seminar in Correctional Practices (2 q.h.)**

(Formerly titled Seminar in Correctional Program Management.)

An analysis of current problems in corrections designed to meet the needs and interests of specific groups of students, practitioners, supervisors, and administrators of correctional programs.

**94.595 The National Police Seminar (3 q.h.)**

An annual, concentrated exploration of current viewpoints, varied solutions, innovative procedures, and critical analyses in the issues facing law enforcement, correctional practices, and security, drawing on exceptionally qualified local and national figures. A research paper under the direction of a faculty adviser is required for credit.

**94.601 Law Enforcement Math I (Formerly titled Seminar in Law Enforcement 94.590.) (2 q.h.)**

A review of elementary algebra: algebraic expressions and operations, equations, word problems. Solutions to mathematical problems in connection with their practical applications in law enforcement.

**94.602 Law Enforcement Math II (2 q.h.)**

Further review: fundamental operations, measurement and computation, solutions of linear and quadratic equations. Probability, trigonometry, statistics, ratio and proportion. *Prereq.* 94.601.

**94.603 Law Enforcement Math III (2 q.h.)**

Methods and applications of algebra: analytic geometry, equations of motion and energy, permutations, combinations. Stress is on problem-solving more than theory. Application of these principles are applied to most areas of law enforcement. *Prereq.* 94.602.

**94.604 Seminar in Law Enforcement (Youth Crime Control) (2 q.h.)**

The criminality and deviance of those between the juvenile and adult age. Consideration is given to: concepts and characteristics of the youthful offender; the role of the family in youth crime; the generation gap; violence of youth hooliganism; drug addiction of youth; ordinary crimes of youth; the youth sub-culture and culture conflict; the role of mass media and education in youth crime; the concepts of freedom and justice in the youth culture; treatment of youthful offenders; and the state of youth crime control in foreign countries.

**94.605 Seminar in Law Enforcement (Victimology) (2 q.h.)**

Criminal-victim relationships, with emphasis on victim precipitated crimes and compensation to the victims. Consideration is given to: concept and significance of "victimology"; time, space, sex, age, and occupational factors in criminal-victim relationships; victims of murder, rape, other violent crimes, and property crimes; victim-typology; the public as victim; restitution to victims of crime; compensation to victims of crime; and the functional responsibility of the victim.

**94.606 Seminar in Law Enforcement (International Crime Control) (2 q.h.)**

Crimes touching upon more than one country, with emphasis on international criminal law principles, treason, and espionage. Concentration is given to: the concept of law in its comparative aspects; customs; treaties; international conventions; "comity;" culture conflicts; the "international personality;" the "at-tempt clause;" the Belgian approach; the Oxford approach; asylum, extradition; international ordinary criminals; political criminals; piracy (on sea and in the air); war criminals; genocide; international courts; League of Nations; United Nations; international criminal statistics; Interpol; the Soviet-type spy-schools; the history of American Intelligence.

**94.607 Seminar in Law Enforcement (Grantsmanship) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

This seminar is designed to familiarize the participants with the orderly sequence of organizational steps required in providing the institutional framework necessary for preparation and submission of applications to granting agencies. Major topics include: Omnibus Crime Control and Safe Streets Act of 1968; functions of the Law Enforcement Assistance Administration; grant application strategy, planning and research.

**94.608 Seminar in Law Enforcement (Law Enforcement Operational Intelligence) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

Designed to provide a theoretical understanding of the value and function of an intelligence unit, including planning, directing, organizing, financing, and other salient features of the administration of these units. Emphasis is placed on organized crime, subversive activities, and liaison programs as they apply to a modern police agency.

**94.609 Independent Studies (2 q.h.)**

Faculty guided research in individually selected topics relating to the criminal justice system.

**94.610 Seminar in Law Enforcement (Collective Bargaining) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

The history and background of collective bargaining in the public sector as it affects members of the law enforcement field; initial establishment of rights of labor, labor legislation—federal and state; preparation for negotiation, resolutions of impasses, final agreement and operation of the contract.

**94.611 Man, Law, and Society I (2 q.h.)**

Designed to help the student to improve his capacity to handle problems in the many institutions and sociological processes of the American legal system, and to see these problems in the perspective of their everyday working interrelationships, in order to heighten his awareness of those aspects of familiar and often unnoticed legal problems which call for a perceptive understanding of the functions of the various institutions involved.

**94.612 Man, Law, and Society II (2 q.h.)**

A general analysis of the way in which major changes occur in the established practices of legal and social organizations and communities. Particularly concerned with the part played by legal institutions in initiating, controlling, and directing or assisting such changes. *Prereq.* 94.611.

**94.613 Man, Law, and Society III (2 q.h.)**

An introduction to the social science concepts and methods in their current and potential application to social and legal problems. Aims to acquaint the student with a variety of social research concepts and methods of special utility in investigating diverse types of social law related problems. *Prereq.* 94.612.

**94.614 Seminar in Law Enforcement (Interviewing Practicum) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

Advanced interrogation methods and procedures; techniques of persuasion; conditioning (negative and positive); the polygraph, its history and methodology; the established rules and procedures required for current diagnosis of truth and deception; the evaluation of the contemporary methods of international law enforcement agencies. *Prereq.* 94.515.

**94.615 Seminar in Law Enforcement (Organized Crime) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

The nature and problems of organized crime; causes and effects; comparative and historic roots; the activities, organization, and economics; possible solutions—the scope and techniques in combating organized crime.

**94.616 Seminar in Law Enforcement (Minorities and the Urban Crisis) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

An investigation of the ethnic and racial origins and characteristics of the American people; the interaction, conflicts, and possibilities of adjustment between the dominant society and minority groups—particularly in contemporary urban settings, and the role and function of police in their inter-relationship with minority groups.

**94.617 Seminar in Law Enforcement (Criminal Behavior) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

An examination of crime and criminal behavior as a social phenomenon. Three principal divisions; sociology of law and its affect; criminal etiology and the scientific analysis of the causes of crime; evaluation of the various rationals of detention as a crime control factor.

**94.618 Seminar in Law Enforcement (Prosecutive Development) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590) *Prereq.* 94.502, 94.504, 94.510.**

Lecture and discussion relating the professional requirements of the modern police officer in the United States; oral testimony; the entire corpus delicti and all other related matters in proper form and sequence; the trial; testimony and the jury; conduct on the witness stand; opposition counsel; the defense of entrapment; opinion testimony; confessions; prospective witnesses; legal standards and the police. *Prereq.* 94.501, 94.504, 94.510.

**94.619 Seminar in Law Enforcement (Forensic Laboratory) (2 q.h.) (Formerly titled Seminar in Law Enforcement 94.590.)**

Crime laboratory organization and the utilization of special equipment for the analysis interpretation, classification, and identification of physical evidence obtained in crime scene searches. The transportation, storage, and security of physical evidence and the effect on the results, coupled with the preparation of exhibits for courtroom presentation. *Prereq.* 94.542.



**94.620 Seminar in Law Enforcement (Intervention Strategies and Tactics for Law Enforcement—Counseling Techniques) (2 q.h.)** (Formerly titled Seminar in Law Enforcement 94.590.)

Basic concepts and principles of intervention as a social work method. Nature of therapeutic relationships, principles of communication. Diagnostic assessment of the person-problem-situation configuration. Goal-setting process. Ego supportive procedures and use of community resources.

**94.621 Seminar in Law Enforcement (Civil Liberties and the Police I) (2 q.h.)** (Formerly titled Seminar in Law Enforcement 94.590.)

An in-depth preparation for the officer facing the practical problems of enforcing the law without breaching the civil rights of the accused and bystanders; individual readings, lectures, group discussions, and preparations from Massachusetts and national interest cases; many incidents pertinent to the actions of the men involved with these problems will be investigated and studied; constitutional interpretation and limitations are the guidelines for the course.

**94.622 Seminar in Law Enforcement (Civil Liberties and the Police II) (2 q.h.)**

Several Supreme Court cases are followed from the time of the call, to the confrontation, arrest, examination in court, appeals, and the direct statements on the problem by jurists of the highest courts. The last section of the term ties in the latest criminal law and civil rights act changes including—but not limited to—the criminal justice and no knock laws and the latest Civil Rights Act provisions. *Prereq.* 94.621.

**94.623 Seminar in Law Enforcement (Drugs) (2 q.h.)** (Formerly titled Seminar in Law Enforcement 94.590.)

Designed to meet the needs of law enforcement personnel in the problematic area of drug abuse; the law, society, classification, distribution, identification, and the effects of drugs.

**94.624 Seminar in Law Enforcement (Executive Development) (2 q.h.)** (Formerly titled Seminar in Law Enforcement 94.590.)

The role of the police administrator within the managerial structure. Special problems unique to the law enforcement executive, decision making, policy formation, planning, controlling, communicating, and directing. A consideration of case studies and surveys will be utilized.

**94.625 Seminar in Law Enforcement (Mental Health and the Police) (2 q.h.)** (Formerly titled Seminar in Law Enforcement 94.590.)

A study of the roles of law enforcement and mental health services. Diagnosis of the triggering mechanisms of behavioral disorders and the suicidal phenomenon; psychiatric and psychological considerations; case studies and the legal process.

**94.626 Seminar in Law Enforcement (Data Processing) (Formerly titled Seminar in Law Enforcement 94.590.)**

An introduction to automated systems utilized in the field of law enforcement; basic program concepts; filing and sorting techniques; available input and output storage media; types and sources of data communications and applications.

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Tufts University
- Arthur P. Chamian, A.B., M.B.A.  
Marketing  
Doran Confectionery Co., Inc.
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Law Enforcement  
Barnstable District Court
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Psychology  
Children's Hospital Medical  
Center
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Philosophy
- Jack Chilnick, B.S., M.Ed., A.C.S.W.  
(Group-Work)  
Allied Health Sciences  
Jewish Rehabilitation Center for  
the Aged—Director, Executive
- John Chmielinski, A.S., B.S.  
Law Enforcement  
Deputy Commissioner—Training  
Corrections  
Mass. Dept. of Correction
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Philosophy
- John Chrunev, B.S.  
Administration Management  
Auerbach Corp.
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Psychology  
Tufts University—  
School of Dental Medicine
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Electronic Data Processing  
American Mutual Insurance Co.
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Law Enforcement  
Mass. Supreme Judicial Court
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Law Enforcement  
Mass. Dept. of Correction
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Massasoit Community College
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Computer Programming  
Polaroid Corp.
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Sociology  
Tufts Medical School—Dept. of  
Community Health and Social  
Medicine
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Finance  
Honeywell, Inc.
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(Ret.) Commonwealth of Massachusetts
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Norfolk County
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Law Enforcement
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Bristol County
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Executive Relocation, Inc.
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Harvard University
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Kennecott Copper Corp.
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Accounting  
Boston Mutual Life Insurance Co.
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Management  
John Hancock Mutual Life Insurance Co.
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Sociology  
Northeastern University
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Modern Languages  
Quincy Junior College
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Political Science & History  
Northeastern University
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Northeastern University
- M. Alvin Goldstein, A.B.  
Electronic Data Processing  
Information Systems Analysis, Inc.
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Accounting—Consultant  
Northeastern University
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Psychology  
Eastern Middlesex Guidance Center

- Michael E. Goodhue, B.A.  
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- Norman Kaplan, A.B., Ph.D.  
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- Paul Shapiro  
*Art*  
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Samuel Shapiro & Co., C.P.A.'s
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- Robert P. Shilansky, A.B., M.A.  
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Assistant District Attorney,  
Norfolk County
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Northeastern University
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Avco Everett Research Lab.
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Administration  
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N. E. Conservatory of Music
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*Management & Organization*  
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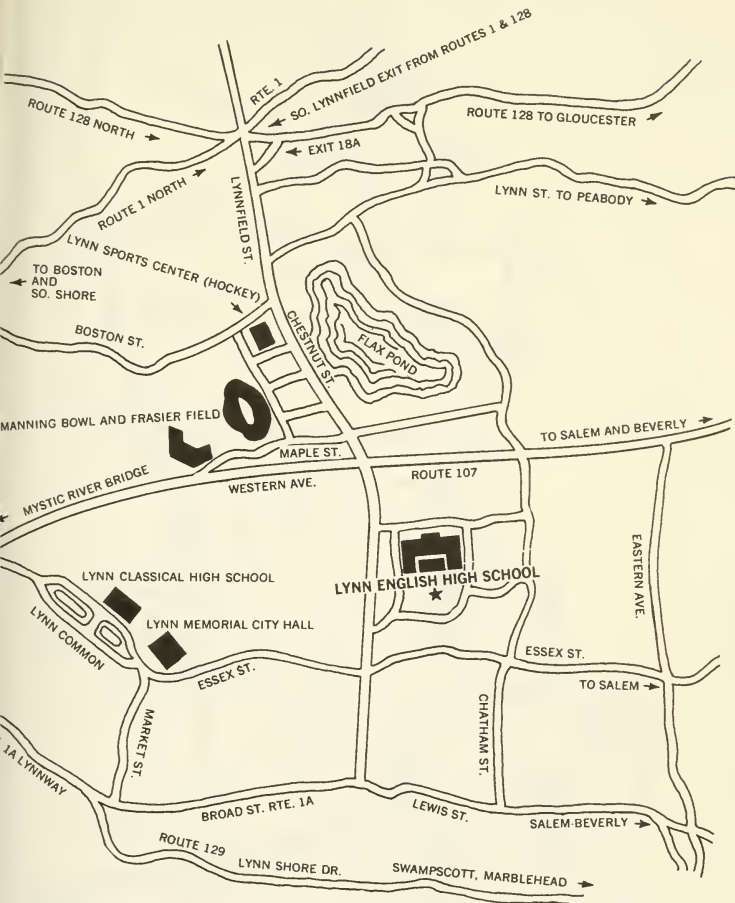
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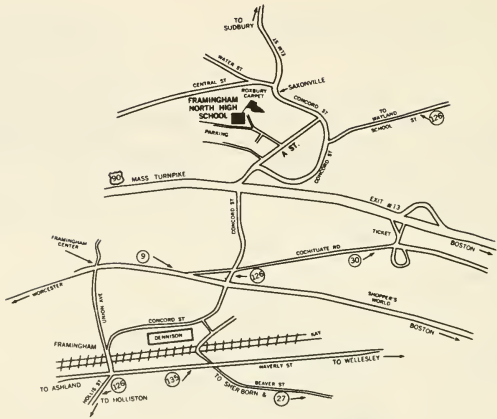
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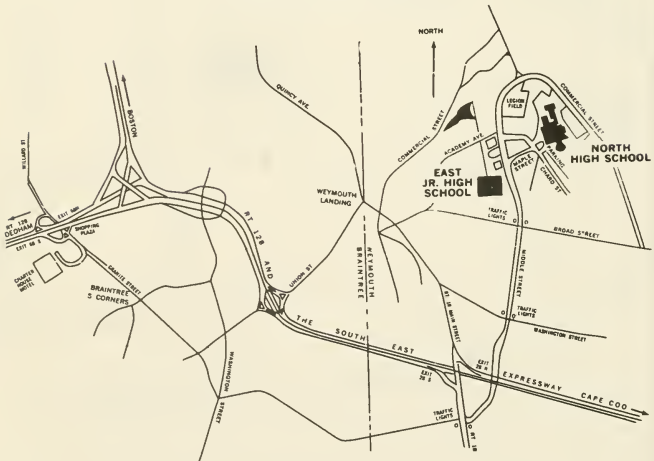
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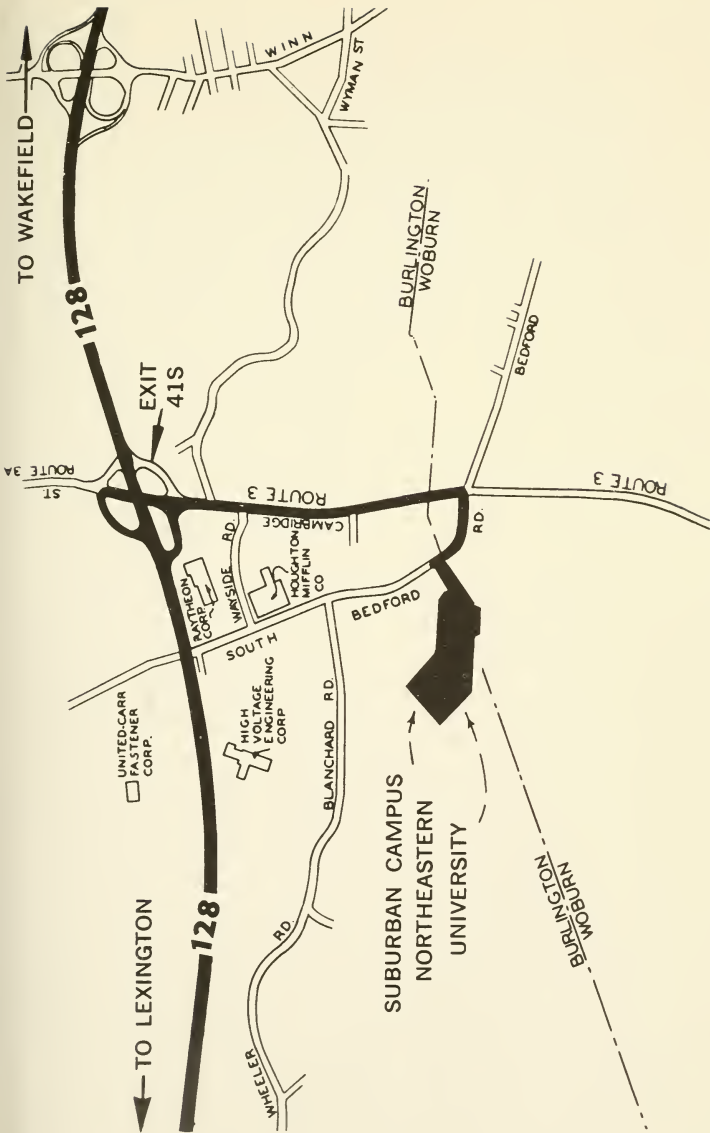


## Framingham North High School



## Weymouth High Schools









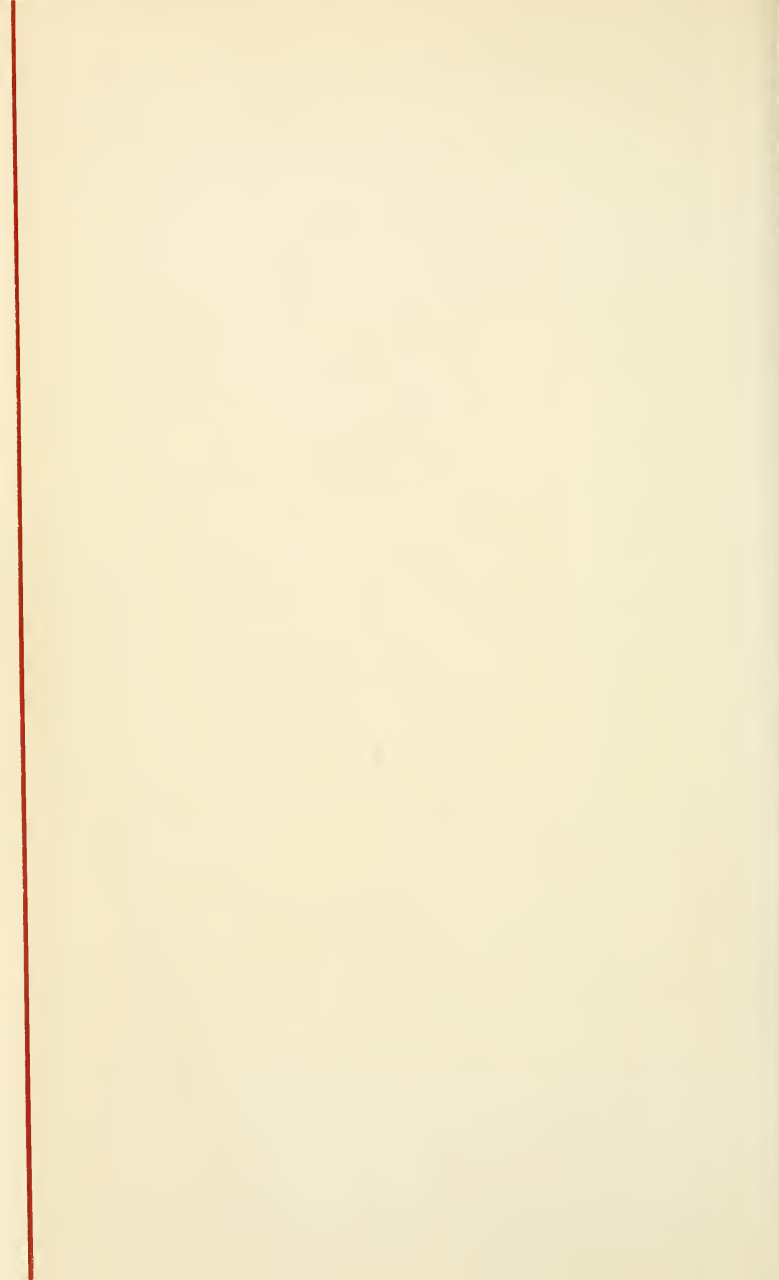




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graduate school of arts and sciences  
1971-1972



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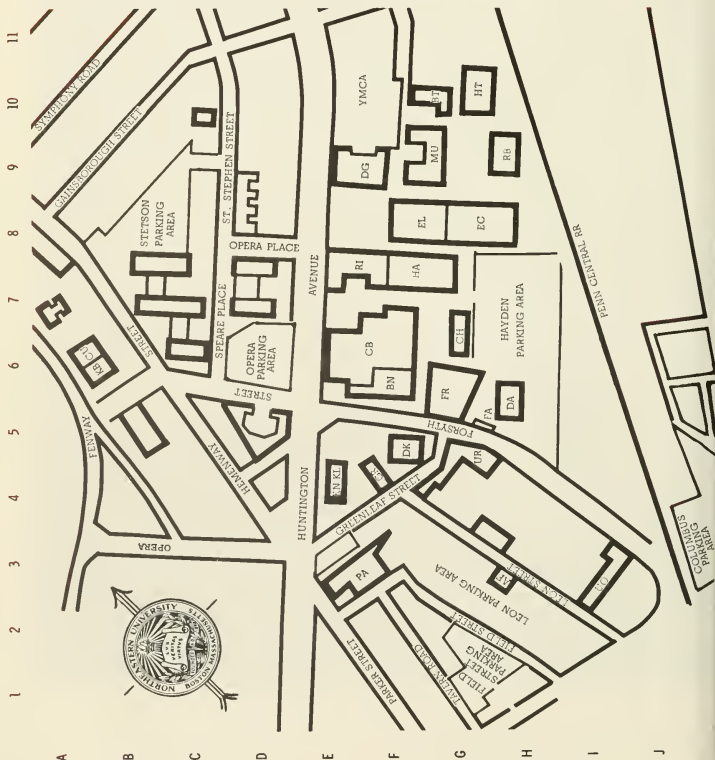
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360 Huntington Avenue  
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Office hours at 304 Hayden Hall:  
Monday through Friday: 8 A.M. — 6 P.M.  
Saturday: 10 A.M. — 2 P.M.



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Building  
Designation

BN Barletta Natatorium  
BT Botolph Building  
CB Cabot Physical Education Ctr.  
CH Churchill Hall  
CU Cushing Hall  
DA Dana Research Center  
DK Dockser Hall  
DG Dodge Library  
EC Eli Student Center and Alumni Auditorium  
EL Forsyth Building  
FR Forsyth Building Annex  
FA Forsyth Dental Building  
GR Greenleaf Building  
HA Hayden Hall  
HT Hurtig Hall, (Chemistry)  
KB Kennedy Building  
KN Knowles Center (Crim. Justice)  
KL Knowles Center (Law)  
MU 11 Leon Street  
PA Afro-American Institute  
RI Mugar Life Sciences Building  
RB Parker Building  
UR Richards Hall  
UR Robinson Hall  
UR United Realty Building



## **ACADEMIC CALENDAR 1971-72**

### **Fall Quarter 1971**

Registration period (1:00-3:00 and 5:30-8:00 p.m., Boston and Burlington only)		
Burlington	Tuesday-Wednesday	September 14-15
Boston	Monday-Friday	September 20-24
Nashua (5:30-7:00 p.m.)	Wednesday	September 22
Classes begin	Monday	September 27

### **Winter Quarter 1971-1972**

Registration period (1:00-3:00 and 5:30-8:00 p.m., Boston and Burlington only)		
Burlington	Tuesday-Wednesday	Nov. 30-Dec. 1
Boston	Monday-Friday	December 6-10
Nashua (5:30-7:00 p.m.)	Wednesday	December 8
Classes begin	Monday	January 3

### **Spring Quarter 1972**

Registration period (1:00-3:00 and 5:30-8:00 p.m., Boston and Burlington only)		
Burlington	Tuesday-Wednesday	March 7 & 8
Boston	Monday-Friday	March 13-17
Nashua (5:30-7:00 p.m.)	Wednesday	March 15
Classes begin	Monday	April 3
Last day to file for Spring		
Commencement	Monday	April 3
Commencement	Sunday	June 18

### **Summer Quarter 1972 (first six-week session)**

Registration period:		
Burlington (5:30-8:00 p.m.)	Monday-Tuesday	June 19 & 20
Boston (5:30-8:00 p.m.)	Wednesday-Friday	June 21-23
No classes at Nashua		
Classes begin	Monday	June 26
Last day to file for		
Fall Commencement	Friday	June 30

### **Summer Quarter 1972 (second six-week session)**

Registration period		
Burlington (5:30-8:00 p.m.)	Monday-Tuesday	July 31-August 1
Boston (5:30-8:00 p.m.)	Wednesday-Friday	August 2-4
Classes begin	Monday	August 7

## UNIVERSITY HOLIDAYS 1971-1972

Columbus Day	Monday	October 11
Veterans' Day	Monday	October 25
Thanksgiving Recess	Thursday-Saturday	November 25-27
Christmas Vacation	Tuesday-Sunday	December 21-January 2
Washington's Birthday	Monday	February 21
Patriots' Day	Monday	April 17
Memorial Day	Monday	May 29
Independence Day	Monday	July 4

This bulletin, published in October 1970, is designed as a prospectus for those considering application for work during the academic year beginning in September of the following year. While the regulations governing application, admission, and degree programs, will generally remain in force during the period covered by this bulletin, the departmental faculty lists and the notices concerning financial aid and obligations must be regarded as merely tentative. A supplement will be available in September 1971.

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1970-1971

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# the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); and the College of Criminal Justice (1967). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, the pharmaceutical sciences, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full-time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

## **GRADUATE AND PROFESSIONAL SCHOOLS**

The nine graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston Bouvé College offers the degree of Master of Science in Physical Education and Master of Science in Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer, Doctor of Philosophy, and Doctor of Engineering in Chemical Engineering

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmaceutical Sciences offers the degree of Master of Science in Hospital Pharmacy, Master of Science in Industrial Pharmacy, Master of Science in Pharmacology, Master of Science in Medicinal Chemistry and Doctor of Philosophy in Medicinal Chemistry.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

## **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## **RESEARCH ACTIVITIES**

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose

services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# buildings and facilities

## MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

## Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

## Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and three divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, and Mathematics and Psychology. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute at Nahant.



The library collections number 250,000 volumes supplemented by some 356,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 1,800 periodical titles, 90,000 documents, and 3,700 sound recordings.

### **Cabot Physical Education Center**

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouv  College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

### **Apartments for Graduate Students**

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

## **SUBURBAN FACILITIES**

### **Suburban Campus**

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

### **Henderson House**

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

### **Marine Science Institute**

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.



# the graduate school of arts and sciences

Thirty years ago the Department of Chemistry and the Department of Physics inaugurated the first graduate programs at Northeastern. In the succeeding years the creation of degree programs in other departments of the College of Liberal Arts led to the formation of the graduate program of arts and sciences in 1958 and finally the Graduate School of Arts and Sciences in 1963. Ten departments now offer work at the graduate level.

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy degree in biology, chemistry, mathematics, physics, psychology, and sociology.

## GENERAL REGULATIONS

The general regulations of the graduate school that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate departmental section for a statement of specific requirements.

### Application

All applicants should address inquiries to the Director of the Graduate School of Arts and Sciences. Initial correspondence directed elsewhere may result in valuable time lost in initiating the admissions procedure.

Application forms and reference blanks will be mailed to the applicant. This material, together with transcripts, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language, required of all applicants whose native language is not English, should be returned to the Director of the Graduate School of Arts and Sciences. Applications for those desiring assistantships should be submitted no later than March 15. Applications received after this date may not be given equal consideration. All necessary supporting documents must be on file with the graduate school office at least four weeks before the date of registration for the quarter in which the student expects to begin his scholastic program. For more detailed information see departmental requirements for admission.

All applicants to the graduate school are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination. These tests are presently required in biology, economics, English, history, mathematics, political science, psychology, and sociology and anthropology. At least two letters of recommendation are required of all candidates. In biology, physics, psychology, and sociology and anthropology, three letters are necessary. Candidates for financial awards should so indicate to those supplying references.

### **Admission**

To be enrolled for graduate work, an applicant must have obtained a bachelor's degree from a recognized institution and provide evidence that he is able to pursue creditably a program of graduate study in his chosen field. His scholastic record must therefore show distinction, and his undergraduate program show breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Admission to the graduate school is for a specific academic quarter. Students who fail to attend must reapply if they wish to do course work in a subsequent quarter. Acceptance to the school is granted upon recommendation of the departmental graduate committee after a review of the completed application. This recommendation is based upon promise of academic success and compliance with minimum criteria established by each department. Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all their expenses while at Northeastern. A visa may not be granted without such certification.

### **Registration**

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

## Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

## Programs of Study

Each student is expected to complete the required courses outlined by his graduate major department as early as possible. All special courses and projects must have the approval of the departmental chairman or his designate prior to registration.

The study load for full-time students is usually four courses per quarter. Part-time students are limited to two courses per quarter unless permission to carry a heavier load is given by the departmental chairman or his designate. Courses in most fields are offered both in the afternoon and evening.

## Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

### A Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

### B Satisfactory

This grade is given to those students whose performance in the course has been at a satisfactory level.

### C Fair

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

### F Failure

This grade is given to those students whose performance in the course is unsatisfactory.

*In addition, the following letter designations are used:*

### I Incomplete without quality designation.

This grade may be given to those students who fail to complete the work of the course.

### W Withdrawn without prejudice.

### S Satisfactory without quality designation.

### U Unsatisfactory without quality designation.

An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade when the deficiency which led to the I is made up to the satisfaction of and in the manner prescribed by the instructor in the course, or, in his absence, to the satisfaction of and in the manner prescribed by the chairman of the department in which the grade is given. The period for clearing such a grade will be restricted to one calendar year from the date of its first being recorded on the student's permanent record.

Any student who wishes to take a make-up examination must obtain permission of the director of the graduate school by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the director to defer it to one of the next two quarters.

### **Class Hours and Credits**

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit. The academic calendar at the front of this bulletin should be consulted in order to determine the opening and closing dates of each quarter and the summer session.

### **Continuity of Program**

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

### **Withdrawals**

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

### **Changes in Requirements**

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

## **Application for the Diploma**

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed in the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

## **THE MASTER'S DEGREE**

### **Admission**

Specific requirements for each degree program will be found on page 23 and in the appropriate paragraphs for each department.

### **Academic Classifications**

Those students who have a bachelor's degree from a recognized program with a high quality of previous work are classified as regular students.

Students whose records do not qualify them for enrollment as regular students may be accepted as provisional students. Provisional students must obtain a B average in the first 12 quarter hours of credit in order to continue in the graduate program.

Those students who are not pursuing a specific degree program are classified as special students. No more than 12 quarter hours of credit earned as a special student may be counted should the student subsequently enter a degree program at Northeastern.

### **Academic Requirements**

A candidate for the master's degree must complete a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

During the first half of the total number of hours of course work required for the degree, the candidate will be expected to maintain a minimum quality point average of 2.5. This average will be calculated quarterly by the graduate school on the basis of A = 4, B = 3, C = 2, and F = 0 and will exclude any transfer credits.

At the completion of three-fourths of the total number of hours of course work required for the degree, the candidate will be expected to have a quality point average of 2.8. To qualify for the degree, a final average of 3.0, equivalent to a grade of B, must be obtained. Not more than six quarter hours of repeated courses or additional courses may be allowed in order to satisfy the requirements for the degree. Moreover, since quarter hours of credit associated with the grade of I will be charged against the maximum number of course hours allowed toward a degree, no more than six quarter hours of permanent I's may be accrued.



Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

### **Comprehensive Examination**

At the discretion of the department, a final written or oral comprehensive examination may be required. This examination will be given at least two weeks before the commencement at which the degree is expected.

### **Thesis**

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the departmental graduate committee.

The thesis must receive a grade of B or better to be accepted. Instructions for the preparation of the thesis may be obtained from the department.

### **Language Requirement**

An examination to show evidence of ability in one or more foreign languages is required in some graduate programs. This knowledge is established by an examination administered by the graduate school. This examination will be given at least twice yearly.

### **Transfer Credit**

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred are in the candidate's field, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at a recognized institution, and have not been used toward any other degree. Students should petition the director of the graduate school in writing for all transfer credit. Grades on transfer credit may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

### **Time Limitation**

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the Committee of the Graduate School of Arts and Sciences.



## **THE DOCTOR OF PHILOSOPHY DEGREE**

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School Office the completion of each requirement for each candidate.

### **Admission**

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

### **Classification and Degree Candidacy**

Students taking advanced graduate work are classified as follows:

#### **1. Doctoral Student**

Students in this classification have been admitted to a doctoral program.

#### **2. Doctoral Degree Candidate**

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

#### **3. Special Students**

This classification is given to students taking advanced graduate work who are not enrolled in a degree program.

### **Residence Requirement**

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University as a full-time graduate student. The committee of each degree program specifies the method by which the residence requirement is satisfied.

### **Qualifying Examination**

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

## **Comprehensive Examination**

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

## **Course Requirements**

The minimum course requirement of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

## **Dissertation**

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program.

## **Language Requirement**

The foreign language requirement is established by the committee in charge of each degree program.

## **Final Oral Examination**

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

### **Transfer Credit**

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

### **Time Limitation**

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

### **Registration**

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

## **INTERDISCIPLINARY PROGRAMS**

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following option is available:

### **Admission**

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school who forwards it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

### **Formation of Interdisciplinary Committee**

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral dissertation. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the director of the graduate school of the membership of the committee as soon as arrangements are complete.

### **Duties of Interdisciplinary Committee**

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

# financial information

## FINANCIAL OBLIGATIONS

### Tuition

#### *Master's Degree Candidates*

The tuition rate for 1971-1972 is \$48 per quarter hour of credit.

#### *Doctoral Candidates*

Tuition for full-time doctoral candidates in 1971-1972 is \$600 per academic quarter of registration. For doctoral degree candidates registered for work performed off campus on a Ph.D. dissertation the charge per quarter is \$200. For doctoral degree candidates who are no longer actively utilizing the resources of the University there is a continuation charge of \$50 per quarter, with the exception of the summer quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

### Fees

A registration fee of \$15 is charged all students when they register for the first time in the graduate school at Northeastern.

Other fees include a charge of \$5 for late payment of tuition; a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged 75 cents a quarter.

All full-time students will pay a nonrefundable University health services fee of \$75 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University health services.

All financial obligations to the University must be discharged by graduation.

### **Refunds**

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund	
Official Withdrawal Filed Within	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

## **FINANCIAL AID**

Northeastern University has available fellowships and assistantships for students who are working toward the master's or doctor's degree. Candidacy for these awards may be established by completing the relevant section of the application for admission. Those students already enrolled should consult their departmental adviser.

### **Teaching Assistantships**

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

### **Graduate Administrative Assistantships**

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching, administrative duties.

### **Northeastern Fellowships**

Many departments provide remission of tuition to full-time students assisting eight hours a week in the administrative work of the department. These awards are normally given to full-time students in the first year of graduate work.

### **Research Fellowships**

A number of departments offer research fellowships including N.I.H., N.S.F., and N.D.E.A. carrying a stipend and remitting tuition. Certain of these grants require half-time work on research in the department,

with the remaining time devoted to course work. Others provide for full-time work on research used for a thesis or dissertation.

### **Martin Luther King, Jr., Scholarships**

These scholarships provide for remission of tuition and all fees and are awarded to qualified full- and part-time black students on the basis of financial need.

### **Doctoral Research Fellowships**

In the departments which give work leading to the Ph.D. degree, research fellowships available for students who have established candidacy for the Ph.D. degree carry a higher stipend than fellowships at the master's level.

### **Appointments**

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of three quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the director of the graduate school.

### **Dormitory Proctorships**

A number of proctorships in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

### **National Defense Student Loan Program**

Under the provisions of an act of the federal government, students carrying an academic load of one half or more are entitled to loans up to \$2500 for one school year and up to a total of \$10,000 for undergraduate and graduate work. The actual amount of any award will be determined on the basis of need and academic promise.

The repayment period begins nine months after the borrower ceases to carry a half-time load and extends ten years from that point. Cancellation of up to 50 per cent of national defense loans including interest is allowed for graduates who enter the field of teaching. Up to 100 per cent may be cancelled for service in certain areas. Additional information and application forms are available from the Office of Financial

Aid. The application deadline is September 1 for full-time students and one month prior to the start of the quarter for which aid is requested for other students.

**Higher Education Loan Plan**

Educational assistance loans may be available from certain banks in the student's home town. These loans, guaranteed by state agencies, carry an interest charge of seven per cent, three per cent of which is paid by the federal government. Graduate students may borrow up to \$1500 for each year of study up to a maximum of \$7500 for both undergraduate and graduate work. Monthly repayment begins nine to twelve months after completion of study and extends up to five years.



## fields of study

*The departmental sections that follow list courses available to a student during the typical period of attendance required to obtain a degree. The quarter in which a specific course will be offered, together with the name of the instructor, the place, and the time, will be found in the course announcement made available in May for the summer quarter and in June for the following academic year.*

# biology

## Professors

Francis D. Crisley, Ph.D.,  
Chairman  
Fred A. Barkley, Ph.D.  
Charles Gainor, Ph.D.  
Charles M. Goolsby, Ph.D.  
Abdul-Karim Khudairi, Ph.D.  
Nathan W. Riser, Ph.D., Director,  
Marine Science Institute

## Associate Professors

Doris J. Dealy, Ph.D.  
Janis Z. Gabliks, D.D.S., Ph.D.  
Charles A. Meszoely, Ph.D.  
Joseph V. Pearincott, Ph.D.  
Fred A. Rosenberg, Ph.D.  
Ernest Ruber, Ph.D.  
Brunhild I. E. Stuerckow, Dr. rer. nat.  
Henry O. Werntz, Ph.D.

## Assistant Professors

H. David Ahlberg, A.B.  
Pooran C. Joshi, Ph.D.  
M. Patricia Morse, Ph.D.  
Samuel E. Moyer, Ph.D.

## THE MASTER OF SCIENCE DEGREE

### Full-Time Program

## THE MASTER OF SCIENCE IN HEALTH SCIENCE DEGREE

### Part-Time Program

## Admission

In addition to the requirements listed on page 23 applicants should have a background which includes one year of organic chemistry, physics, and mathematics and six quarter courses of the biology undergraduate core curriculum or its equivalent. Students admitted with deficiencies should remove them during the first 20 quarter hours of graduate work.

## Program

Forty-six quarter hours of academic work are required. A candidate for either degree is expected to take forty hours of course work including four hours of seminar, and one laboratory course in microbiology, unless previously taken elsewhere. Transfer credits will be accepted only from those schools offering graduate programs in biology. Application for such credit should be made in writing to the director of the graduate school during the first quarter following the student's assign-

ment to an academic adviser. Other limitations on transfer credit are listed on page 28. Work may be taken from other departments as approved by the student's adviser.

During his tenure, in addition to the above course requirements, each student pursuing work toward the master of science degree in the full-time program must enroll for a minimum of six credits of work in 18.990, Special Topics in Biology, or 18.991, Research for the Master of Science degree. After initial election of either 18.990 or 18.991 the student must register for either of these courses for each quarter until the work is completed. Work in 18.990, Special Topics in Biology, is pursued under the supervision of an individual faculty member, by mutual agreement. It may take the form of a comprehensive, critical review of the literature in a specialized area and/or a specific program of experimental work on a single topic. If experimental work has been elected under 18.990 it may later be expanded, with permission of the departmental graduate committee, into a master's thesis with a topic and adviser and a committee of three members approved by the departmental graduate committee. Grades in 18.990 or 18.991 are recorded as "Satisfactory" until all work is completed, culminating in either a comprehensive, well-written report — which must be reviewed by the department graduate committee — or a thesis. A comprehensive examination in the last six months of the master's program is required of all students, except those presenting a thesis. For the latter a final oral examination on the thesis is required. The department encourages the pursuit of a thesis wherever feasible.

The program leading to the Master of Science in Health Science degree is designed for part-time students who may progress according to their abilities, the time available, and the need or desire to extend their education into interdisciplinary work involving biology or allied areas such as the health sciences. Students who entered the program in the beginning of the 1968–1969 academic year may elect to substitute six quarter hours of course work credit for the required 18.990, Special Topics in Biology or 18.991, M.S. Thesis. Those students electing the course option must take a comprehensive examination in the last six-month period of their program, similar to the examination required of students pursuing Special Topics work. With the permission of the departmental graduate committee the two master's degree programs are interchangeable.

## THE DOCTOR OF PHILOSOPHY PROGRAM

### Admission

Applicants who will have a master's degree or its equivalent at entry may be considered for direct admission to the doctoral program. Those who will not may be considered only for admission to the master's

program, and, after satisfactory completion of 30 quarter hours of graduate study, may then be considered for admission to the doctoral program.

### **Residence Requirement**

After he has been admitted to the doctoral program, the student may satisfy the residence requirement by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years or the equivalent in full-time study.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations.

### **Qualifying Examination**

Students entering the doctoral program will be expected to have had the equivalent of an M.S. degree at Northeastern before taking their qualifying examination. Students who have been accepted into the doctoral program will normally be expected to complete the qualifying examination by the end of three quarters at Northeastern University at a time specified by the departmental graduate committee. The candidate will be expected to demonstrate an advanced knowledge of biological concepts. The examination will be oral and approximately two hours in duration. Eligibility to continue in the program toward the Doctor of Philosophy degree is contingent upon satisfactory performance on the qualifying examination.

### **Comprehensive Examination**

The comprehensive examination requirement will be fulfilled by two written examinations, one in the major area of specialization and the other in closely related areas. The candidate may apply through his adviser after completing the foreign language requirement and at least one quarter prior to the oral examination.

### **Course Requirements**

After the establishment of candidacy, any further course requirements will be established by the dissertation adviser and approved by the departmental graduate committee.

### **Dissertation**

In most cases, arrangements for the dissertation director will have been made before the completion of the qualifying examination. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The dissertation director advises the

candidate on the research for the dissertation, which is to be performed in accordance with general graduate school regulations. He serves as chairman of the dissertation committee, which must approve the dissertation before the degree may be conferred. The doctoral committee shall consist of at least five members.

### **Language Requirement**

Ability to read and translate biological literature in one foreign language must be established by the candidate. In order to maximize the usefulness of this language as a tool of research, the student should take the language examination as early as possible. The examination will be administered by the Department of Biology, or in certain cases, by the Modern Language Department. French, German, and Russian are the three most important foreign languages for the biologist. Students will be expected to choose one of these languages for their examination, but another language may be substituted where there is significant literature in the area of interest.

### **Tool of Research**

A tool of research is required in addition to the above language. This requirement may be fulfilled through either passing a second foreign language examination in a language in which there is significant literature, or completion of a program in the general principles of statistics, biometry, and/or computer programming.

### **Final Oral Examination**

This examination will be held in accordance with the general regulations of the graduate school.

## **INTERDISCIPLINARY PROGRAMS**

### **Admission**

Application and credentials for admission to interdisciplinary programs involving the Biology Department, where this department is clearly the department of registry, as described under "General Regulations," should be submitted as described under the heading of "Admission" in the section "The Doctor of Philosophy Program" for biology. The interdisciplinary committee will consist of at least five members. The composition of this committee will be determined by mutual consent between the departments involved, but will have at least three members from the Biology Department if the dissertation adviser is from this department. Upon admission, suitable interdisciplinary course requirements will be determined by the interdisciplinary committee.

## Qualifying Examination

Students accepted into the program will normally be expected to complete the qualifying examination by the end of three quarters at Northeastern University. At least five areas of study will be covered by the qualifying examination, at least three of which will be oral examinations chosen by the candidate from the following areas: biochemistry, botany, ecology, genetics, microbiology, physiology, and zoology. The remaining components of the examination will be specified and evaluated by the other participating department. With the exceptions of the procedures for admission and examinations for qualification, the remaining requirements and procedures are as specified under "The Doctor of Philosophy Program" for biology.

## DESCRIPTION OF COURSES

*All courses carry four quarter hours of credit unless otherwise specified.*

### 18.802 Physiological Chemistry

Intermediary metabolism and nutrition.

### 18.803 Biometrics

Statistical methods applied to biological samples and analysis of biological research data. *Prep. Algebra*

### 18.804 Lower Invertebrates

Taxonomy, morphology, embryology, and life histories of acoelomate phyla (Marine Science Institute).

### 18.805 Coelomate Invertebrates

Biology of annelida, arthropoda, mollusca, and echinodermata (Marine Science Institute).

### 18.806 Malacology

Functional morphology, embryology, systematics, and ecology of the major groups of mollusks. *Prep. Invertebrate Zoology.*

### 18.807 Parasitology

Symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods.

### 18.808 Vertebrate Zoology (5 q.h.)

Evolution, phylogeny, anatomy, physiology, behavior, population dynamics, reproduction, etc., of the vertebrates. Field collection, preparation, and study of local vertebrates will be carried out in the laboratory. *Prep. Comparative Anatomy; or Comparative Vertebrate Anatomy and Embryology.*

### 18.809 Mammalogy (5 q.h.)

Phylogeny, anatomy, physiology, behavior, reproduction, population dynamics, and natural history of the mammals. The course will include student presentation of the recent advances in mammalogy. Field collection and laboratory preparation and study of specimens will be included. *Prep. 18.808.*

**18.810 Ichthyology**

Natural history and systematics of fishes, with emphasis on marine species (Marine Science Institute).

**18.811 Human Ecology (3 q.h.)**

Parameters of the human ecological niche, man's effect on them, and their consequences for him. *Prep. Basic Ecology or consent of instructor.*

**18.812 Dynamics of Aquatic Ecology**

Chemical, physical, and biotic factors influencing coastal and lake communities.

**18.816 Horticultural Theory**

An advanced study of methods used in the cultivation of plants.

**18.819 Principles of Systematics (3 q.h.)**

Codes of nomenclature. Biological principles basic to methodology of the preparation of monographs and of faunas and floras.

**18.825 Plant Nutrition and Metabolism**

Mineral nutrition, photosynthesis, metabolic pathways, and translocation in higher plants.

**18.826 Plant Growth and Reproduction**

Plant hormones, growth, development, and physiology of reproduction.

*Prep. 18.825.*

**18.827 Physiology of Plant Growth and Development (2 q.h.)**

A general coverage of the internal and environmental factors that influence the physiology of plant growth and development. The mechanisms by which plant growth hormones regulate the physiology of plants will be discussed with particular emphasis on the roles of auxins, gibberellins, cytokinins, and phytochrome.

**18.829 Fossil Plants (3 q.h.)**

Plant forms from past times.

**18.830 Marine Algae**

Systematics, life histories, and ecology of marine algae, with emphasis on the flora of the Gulf of Maine (Marine Science Institute).

**18.831 Plant Morphogenesis I**

A study of the continually unfolding series of changes in the life of the plant. The origin of form, experimentally controlled development, and external and internal factors that govern development of form. *Prep. 18.137, 18.234.*

**18.832 Plant Morphogenesis II**

Plant tissue, organ, and cell culture techniques employed in the study of morphogenetic processes. *Prep. 18.831.*

**18.833 Photosynthesis (2 q.h.)**

A general discussion of the biochemistry and physiology of photosynthesis with particular emphasis on recent discoveries in electron transport, chloroplast structure, and CO<sub>2</sub> assimilation. The evolution and requirements of photosynthesis will also be discussed. *Prep. 18.827.*

**18.834 Environmental and Population Biology (2 q.h.)**

Physico-chemical factors influencing and influenced by organisms. Interactions among individual organisms and among species. Students will participate in lectures and laboratories given for 18.134. Individual work on specialized aspects of ecology will be assigned. *Prep. One year of General Biology, including plant and animal biology.*

**18.835 Mammalian Physiology**

Structural and biochemical aspects of mammalian cells. Bioelectric phenomena. Muscle and nerve function. Physiology of digestive, cardiovascular, and respiratory systems. Kidney and its functions. Reproductive physiology and endocrine system.

**18.840 Comparative Physiology of Regulatory Mechanisms (2 q.h.)**

Principles and selected examples of physiological response to environmental variation. *Prep. Basic Physiology.*

**18.842 Vertebrate Endocrinology (2 q.h.)**

Regulation of physiologic processes in vertebrates by hormones and related substances.

**18.843 Procedures in Endocrinology (3 q.h.)**

**18.850 Population Genetics**

Mendel's laws and principles of genotype dynamics in populations of organisms. Mechanisms of evolution. *Prep. Basic Genetics.*

**18.851 Cytogenetics (2 q.h.)**

Classical and contemporary topics of cytogenetics in plant and animal material with emphasis on medical applications. *Prep. Basic Genetics.*

**18.855 Insect Metabolism (2 q.h.)**

Food consumption and intermediary metabolism in insects.

**18.860, 18.861 Cell Biophysics and Biochemistry I, II (5 q.h.)**

Biogenesis and ultrastructure of the cell considered together with the biophysical procedures and biochemical patterns used in the study of cellular and tissue components. *Prep. Organic Chemistry and General Biology.*

**18.863 Neurophysiology (2 q.h.)**

The biophysical function of nerve cells including the resting potential energy, the reception and transmission of stimuli, and the coding of neuronal signals.

**18.864 Neurophysiology Laboratory (2 q.h.)**

Introduction into neurophysiological methods with emphasis on sensory physiology. *Prep. 18.863 (may be taken concurrently).*

**18.870 Tropical Field Studies (1 q.h. per week)**

Field work under direct supervision of faculty (Marine Science Institute).

**18.903 Environmental Microbiology**

The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations. *Prep. 18.220 or equivalent.*



**18.905 Marine Microbiology**

Morphological, physiological, and ecological factors concerning marine microorganisms. Taxonomic problems, microbial association, and general methodological approaches to the study of marine microorganisms. *Prep. 18.220 or equivalent.*

**18.907 Food Microbiology (2 q.h.)**

Microbiology of food with emphasis on the pathogenic types and their interactions with other groups indigenous to food. *Prep. 18.220 or equivalent.*

**18.908 Food Microbiology Laboratory (2 q.h.)**

Detection, quantification, and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types. *Prep. 18.907 (may be taken concurrently).*

**18.909 Animal Virology**

Physical and chemical properties of viruses. Viruses as intracellular parasites. Viral replication and genetics, host-virus interaction, pathogenesis, diseases, tumor viruses, and serological reactions. Laboratory sessions will consist of demonstrations emphasizing use of animals, eggs and animal cell cultures for cultivation, isolation, and identification of viruses. *Prep. 18.220 and 18.242 or their equivalent and Biochemistry.*

**18.910 Microbial Genetics (3 q.h.)**

Principles of bacterial and bacteriophage genetics. Nature of variation and inheritance and the mechanisms of exchange of genetic material. *Prep. 18.220 or equivalent.*

**18.911 Microbial Genetics Laboratory (2 q.h.)**

Origin, isolation, and characterization of mutants. Mechanisms of genetic exchange in bacteria and bacteriophage. *Prep. 18.910 (may be taken concurrently).*

**18.940 Microbial Biochemistry**

Study of the enzymatic reactions, intermediate products, and metabolic pathways involved in carbohydrate, protein, and nucleic acid metabolism by microorganisms. *Prep. 18.220 and 18.240 or equivalents, and Biochemistry.*

**18.980 Seminar (1 q.h.)**

Various topics and newer developments in botany, microbiology, physiology, and zoology covered in depth. Student presentations are emphasized.

**18.990 Special Topics in Biology (credit variable)**

Special study of a selected topic under direction of a faculty member. Topic and direction of study to be arranged with the faculty member supervising the study.

**18.991 M.S. Thesis**

Research methods of some special field and their application to a specific problem, under direction of a faculty member.

**18.992 Special Investigations in Biology (credit variable)**

Laboratory studies on a topic not directly related to research being pursued for a thesis or dissertation.

**18.995 Ph.D. Dissertation**

Original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a faculty member.

**73.855 Concepts in Pharmacology (4 q.h.)**

Selected areas of pharmacology are examined in depth with special reference to interactions of drugs and other chemical agents with biological systems. Emphasis is placed on biochemical mechanisms, experimental design, evaluation of data utilizing conventional statistical procedures, and techniques employed in pharmacological evaluations.

**73.856 Concepts in Toxicology (4 q.h.)**

Concepts of modern toxicology in which emphasis is placed on biochemical mechanisms underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology, including acute, subacute, and chronic effects of drugs in the experimental animal. Consideration of the predictive value of animal studies for drug effects in man.

*All undergraduate biology courses in the series designated 18.200 — 18.300, and selected other courses as indicated below, are available for graduate credit. Please consult the undergraduate or other appropriate bulletin for course details.*

<b>18.158, 18.159 Animal Physiology I, II</b>	3 cl. 3 lab. 4 q.h.
<b>18.208 Comparative Vertebrate Anatomy</b>	3 cl. 6 lab. 5 q.h.
<b>18.209 Developmental Anatomy</b>	3 cl. 6 lab. 5 q.h.
<b>18.210 Invertebrate Zoology</b>	3 cl. 6 lab. 5 q.h.
<b>18.211 Parasitology</b>	3 cl. 3 lab. 4 q.h.
<b>18.212 Vertebrate Paleontology</b>	3 cl. 3 lab. 4 q.h.
<b>18.220 Advanced General Microbiology</b>	3 cl. 4 lab. 4 q.h.
<b>18.227 Animal Histology</b>	2 cl. 3 lab. 3 q.h.
<b>18.228 Histological Technique</b>	1 cl. 6 lab. 3 q.h.
<b>18.231 Lower Plants</b>	3 cl. 4 lab. 4 q.h.
<b>18.232 Higher Plants</b>	3 cl. 3 lab. 4 q.h.
<b>18.233 Systematic Botany</b>	2 cl. 6 lab. 4 q.h.
<b>18.234 Plant Anatomy</b>	2 cl. 6 lab. 4 q.h.
<b>18.235 Economic Botany</b>	3 cl. 3 lab. 4 q.h.
<b>18.237 Introduction to Plant Physiology</b>	3 cl. 6 lab. 5 q.h.
<b>18.236 Horticulture</b>	3 cl. 3 lab. 4 q.h.
<b>18.240 Microbial Physiology</b>	3 cl. 4 lab. 5 q.h.
<b>18.242 Medical Microbiology</b>	3 cl. 4 lab. 4 q.h.
<b>18.244 Serology-Immunology</b>	3 cl. 6 lab. 5 q.h.
<b>18.251 Comparative Animal Physiology</b>	3 cl. 3 lab. 4 q.h.

**01.950 Air Pollution (2 q.h.)**

Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods.

**01.952 Industrial Hygiene (2 q.h.)**

Factors in the industrial environment that adversely affect the health, comfort, and efficiency of the worker. Industrial surveys, and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature, and humidity.

**73.852 Radiation Biology (2 q.h.)**

Special topics on the effects and uses of radiation in the life sciences. Concepts in the applications of radiation in pharmacogenetics, growth and aging, biochemical responses, measurement techniques, and dosimetry.

# chemistry

## Professors

Karl Weiss, Ph.D.,  
Chairman  
W. Fay Luder, Ph.D.  
Alfred Viola, Ph.D.

## Associate Professors

William E. Cass, Ph.D.  
Bill C. Giessen, Dr. Sc. Nat.  
David M. Howell, Ph.D.  
Conrad M. Jankowski, Ph.D.  
Elmer E. Jones, Ph.D.  
Barry L. Karger, Ph.D.

John L. Roebber, Ph.D.  
Robert N. Wiener, Ph.D.

## Assistant Professors

Donald C. Clagett, Ph.D.  
Robert B. Davis, Ph.D.  
Darryl D. DesMarteau, Ph.D.  
J. Robert Huber, Dr. Sc. Tech.  
Henry E. Keller III, Ph.D.  
William M. Reiff, Ph.D.

## Lecturer

Albert H. Soloway, Ph.D.

## Admission

In addition to the admission requirements listed on page 23 an applicant must have completed not less than four full-year chemistry courses of the level required of an undergraduate major in chemistry. These must include organic, physical, and analytical chemistry. Admission policy favors those who have taken more chemistry than these minima. In addition, one year each of college physics and calculus are required, and further work in these subjects is desirable.

For the full-time program, these admission requirements may be modified to accommodate applicants who have taken fewer courses than indicated above, but who have outstanding records and a strong interest in chemical or interdisciplinary research. See also the description of interdisciplinary programs.

## THE MASTER'S DEGREE

### Full-Time Program

The normal full-time program consists of a total of 40 quarter hours of courses, seminars, research, and a thesis based on this research. Each student is required to take at least 24 quarter hours of credit in courses. No more than 14 quarter hours of credit may be assigned to 12.991, Research and Thesis for the Master of Science degree. Each student is required to attend 12.990, Seminar, in each term. One credit is assigned to a student for each term in which he conducts a seminar, up to the maximum of two credits.

## Part-Time Program

The admission requirements for this program are the same as for the full-time program, but course requirements differ, and students may progress according to their abilities and the time available.

The following are required courses in the part-time program:

	Total Credits
12.821 Analytical Separations .....	2
12.822 Electroanalytical Chemistry .....	2
12.823 Optical Methods of Analysis .....	2
12.841, 12.842, 12.843 Advanced Inorganic Chemistry I, II, III	6
12.861, 12.862, 12.863 Advanced Organic Chemistry I, II, III	6
12.881, 12.882 Thermodynamics I, II .....	4
12.885, 12.886 Atomic and Molecular Structure I, II .....	4
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Six additional credits must be taken in graduate chemistry courses. The remaining eight credits may be taken in any graduate courses in mathematics, engineering, or science for which the student has the necessary preparation.

## THE DOCTOR OF PHILOSOPHY DEGREE

The doctoral program in chemistry may be pursued only in residence. The additional requirements beyond those of the master's degree are designed to demonstrate superior proficiency in original research, including technical reading ability in two foreign languages and familiarity with current advances in one of the main divisions of chemistry. Any student who wishes to pursue the doctorate must petition the department for acceptance into this program. If accepted, a student is considered to be in the doctoral program as soon as he takes up full-time residence.

### Residence Requirement

The residence requirement is satisfied after one year of full-time graduate work or two years of half-time work; however, it is expected that at least two years of full-time work after establishment of degree candidacy will be necessary to complete the doctoral degree requirements. If a student holds a teaching assistantship which occupies one half of his time, his residence requirement is being discharged at half rate. No other part-time arrangements are permitted. If a candidate has a research fellowship which supports his research for the doctoral dissertation, his residence requirement is discharged at full rate.

### Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

### **Qualifying Examination**

Qualifying examinations are offered in the fields of analytical, inorganic, organic, and physical chemistry. There are eight examinations offered each year in each field. A student must pass four of these.

A student is eligible to take the qualifying examination if:

- (a) he has entered with a bachelor's degree and compiled a 3.0 average in eight courses taken in the first year of residence;
- (b) he has been admitted to the doctoral program with an awarded master's degree;
- (c) he is a part-time student who has petitioned the department to do so.

Students in category "a" must pass the qualifying examinations by July 1 of their second year of residence. Students in category "b" must pass the qualifying examinations by July 1 of their first year of residence. Students in category "c" will have the conditions set at the time their petition is approved.

### **Course Requirements**

A candidate is normally required by his faculty adviser to do some course work beyond the 40 quarter hour minimum. The number and nature of these courses are individually determined for each candidate.

### **Dissertation**

In most cases, arrangements for a dissertation adviser will have been made before the completion of the qualifying examination. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The dissertation adviser directs the research for the dissertation and serves as chairman of the dissertation committee, which must approve the dissertation before the degree may be conferred.

### **Language Requirements**

Proficiency must be demonstrated in two foreign languages as specified by the departmental graduate committee in accordance with the general graduate school regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

## Final Oral Examination

This examination will be held in accordance with the graduate school regulations.

## DESCRIPTION OF COURSES

*All courses carry two quarter hours of credit except seminar and research.*

### **12.803, 12.804, 12.805 Physical Chemistry I, II, III**

A survey of the major areas of physical chemistry. *Prep. Consent of instructor. The complete three quarter sequence must be taken to meet the physical chemistry requirement, but students intending to do research in physical chemistry may not use this course to meet the physical chemistry requirement.*

### **12.821 Analytical Separations**

Theory and practice of analytical separation techniques. Emphasis will be on fundamentals as they relate to practice. Topics will be based mainly on chromatographic processes including gas and high speed liquid chromatography. Other topics will include zone refining, liquid-liquid extraction, and electrophoresis.

### **12.822 Electroanalytical Chemistry**

The principles and practice of electrometric methods of analysis. Topics of discussion will include: electrogravimetry, coulometry, polarography, chronopotentiometry, and pH measurements. An extensive discussion of titration end-point detection systems will include: potentiometric, conductometric, amperometric, and high frequency methods.

### **12.823 Optical Methods of Analysis**

The principles and practice of optical methods of analysis. Topics will include infrared, ultraviolet, and visible analytical spectroscopy as well as such techniques as flame emission and atomic absorption spectroscopy. Nuclear magnetic resonance, electron spin resonance, and mass spectrometry will also be discussed.

### **12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III**

Selected topics of current importance in analytical chemistry.

### **12.827 Computers in Chemical Instrumentation**

A laboratory-lecture course illustrating the use of small digital computers to real-time control of chemical instruments. Topics will include logic modules, BASIC programming, coupling computer to several analytical instruments, such as gas chromatographs. *Prep. 12.821 or 12.822 or consent of instructor. Enrollment will be limited.*

### **12.841 Advanced Inorganic Chemistry I**

Characteristics of atoms and molecules based on their electronic structure and the periodic classification of elements. Structure of crystals. Electrostatic complexes. Advanced chemistry of lighter elements. Acid and base behavior. *Prep. One year of physical chemistry.*

### **12.842 Advanced Inorganic Chemistry II**

Advanced treatment of the chemistry of transition metals; oxidation-reduction behavior; nuclear properties. *Prep. 12.841.*

**12.843 Advanced Inorganic Chemistry III**

Application of molecular orbital theory. Determination of electron distribution in transition metal compounds; Moessbauer spectroscopy and magnetochemistry. Crystal symmetry. Introduction to theory of solids; semiconductors and metals; nonstoichiometric compounds. Solid state reactions. *Prep. 12.842 and 12.885.*

**12.846 Coordination Chemistry**

Coordination compounds: their experimental detection, calculation of stability constants, factors affecting solubility and stability constants. Ligand field theory. Acidity, color, and lability of complexes. Kinetic and stereochemical studies of inorganic reaction mechanisms. *Prep. 12.843.*

**12.847, 12.848, 12.849, 12.850 Special Topics in Inorganic Chemistry I, II, III, IV**

Selected topics of current importance in inorganic chemistry. *Prep. 12.842 and consent of instructor.*

**12.851 Structure Determination in Solids**

X-ray, electron, and neutron diffraction; elements of crystallography; computer-aided calculations. Analytical techniques; important inorganic and organic structure types. *Prep. 12.843.*

**12.852 Ligand Field Theory**

Crystal field theory of ions in weak and strong fields. Molecular orbital theory of transition metal complexes. Magnetic properties and electron spin resonance effects. *Prep. 12.843 and 12.886.*

**12.861, 12.862 Advanced Organic Chemistry I, II**

An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. One year of organic chemistry.*

**12.863 Organic Chemical Properties**

Discussion of the structure and properties of organic chemicals. *Prep. None, but 12.862 recommended.*

**12.864, 12.865 Stereochemistry I, II**

Geometrical and optical isomerism in organic compounds. Conformational analysis. *Prep. 12.863.*

**12.866 Spectrometric Identification of Organic Compounds**

Correlation of structures of organic compounds with their ultraviolet, infrared, nuclear magnetic resonance, and mass spectra. *Prep. 12.862 (not open to students who have taken 12.878, 12.879).*

**12.867, 12.868, 12.869 Natural Products I, II, III**

Isolation, structure determination, synthesis, and transformations of selected classes of organic compounds of biological interest. *Prep. 12.862 (need not be taken in sequence).*



**12.871, 12.872, 12.873 Special Topics in Organic Chemistry I, II, III**

Selected topics of current importance in organic chemistry. *Prep. 12.862 and consent of instructor.*

**12.876, 12.877 Mechanisms of Organic Reactions I, II**

Consideration of the fundamental factors influencing the course of a chemical reaction. Study of the effects of structural and environmental changes on the mechanisms of organic reactions. *Prep. 12.865.*

**12.881 Thermodynamics I**

First Law of Thermodynamics, Thermochemistry, Second and Third Laws, Equilibrium. *Prep. One year of physical chemistry.*

**12.882 Thermodynamics II**

Partial Molar Properties, Mixtures, E.M.F. *Prep. 12.881.*

**12.885 Atomic and Molecular Structure I**

Introduction to wave mechanics, atomic structure, spectroscopy. *Prep. One year of physical chemistry.*

**12.886 Atomic and Molecular Structure II**

The chemical bond, diatomic molecules, polyatomic molecules. *Prep. 12.885.*

**12.891 Special Topics in Physical Chemistry**

Selected topics of current importance in physical chemistry. *Prep. Consent of instructor.*

**12.892 Selected Topics in Solid State Chemistry**

Band theory. Metals, semiconductors and insulators. Thermal, magnetic, and transport properties. Alloy phases. Phase transformations and crystal defects. Surface effects. Material preparation techniques. *Prep. 12.885.*

**12.893 Kinetics and Statistical Thermodynamics I**

Maxwell-Boltzmann statistics, quantum statistics; partition functions and thermodynamic properties, chemical equilibrium, fluctuations. Experimental aspects of reaction kinetics. *Prep. 12.882 and 12.885.*

**12.894 Kinetics and Statistical Thermodynamics II**

Collision and transition state theories of reaction rates. Relaxation theory. Theory of unimolecular reactions. Kinetics in liquid solutions. Fast reactions in liquids. Catalysis, isotope effects, and photochemistry. *Prep. 12.893.*

**12.895 Statistical Mechanics I**

Distribution functions. Ensembles. Entropy. Quantum generalization. Perfect gases with internal degrees of freedom. *Prep. 12.894.*

**12.896 Statistical Mechanics II**

Quantum perfect gases. Fermi-Dirac and Bose-Einstein statistics. Some simple solids. Application to liquids and solutions. *Prep. 12.895.*

**12.897 Quantum Chemistry I**

Linear algebra and the formulation of quantum theory. The quantum mechanics of simple systems. Angular momentum. The central field problem and the one-electron atom. *Prep. 12.886.*

**12.898 Quantum Chemistry II**

Variational method and perturbation theory. Electron spin. SCF method and many-electron atoms. *Prep. 12.897.*

**12.899 Quantum Chemistry III**

Group theory. Small molecules. Time-dependent theory and selected advanced topics. *Prep. 12.898.*

**12.901 Polymer Chemistry I**

Introduction to polymers. Major emphasis on synthesis. Step-reaction, chain-reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and crosslinking. *Prep. One year of organic chemistry and one year of physical chemistry.*

**12.902 Polymer Chemistry II**

Physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semi-crystalline states. *Prep. 12.901.*

**12.903 Polymer Chemistry III**

Industrial practice. Polymer processing. Fibers. Elastomers. Coatings. Adhesives. Reinforced plastics. Relationship of polymer structure to usage. *Prep. 12.902.*

**12.921 Biochemistry I**

Description of the components of biochemistry, including the chemistry of carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, nucleotides, and nucleic acids. Consideration of Henderson-Hasselbalch expression, buffers, and importance of pKa. *Prep. One year of organic chemistry and one year of physical chemistry.*

**12.922 Biochemistry II**

Discussion of enzymes, enzyme kinetics, and mechanisms of enzymatic reactions. An introduction of the methods used for intermediary metabolism, bioenergetics, biological oxidation-reduction reactions, and the electron transport chain are presented. A consideration is made of carbohydrate metabolism, including the citric acid cycle, the Embden-Meyerhof pathway, and the pentose phosphate pathway. Use of isotopes in biochemistry and the role of high-energy phosphate compounds are outlined. *Prep. 12.921 or equivalent.*

**12.923 Biochemistry III**

Lipid metabolism is presented, including: the fatty acid cycle; the biosynthesis of fatty acids; and the biological formation of the prostaglandins, cholesterol and the steroid hormones. The metabolism of the various amino acids is considered including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Metabolism of nucleic acids and their building blocks are discussed as well as the genetic basis of protein synthesis, the genetic code, and mechanisms of control. *Prep. 12.922.*

**12.990 Seminar (1 q.h.)**

Oral reports by the participants on current or recent investigations in chemistry.

**12.991 Research and Thesis for M.S. (maximum: 12 q.h.)**

Original research and a written thesis thereon, under supervision of a faculty member.

**12.995 Research and Dissertation for Ph.D.**

Original research in depth, representing a significant contribution of new chemical knowledge, and a written dissertation thereon, under the supervision of a faculty member.

# economics

## **Professors**

Morris A. Horowitz, Ph.D.,  
Chairman  
Irwin L. Herrnstadt, Ph.D.  
Wilfred S. Lake, Ph.D.  
Gustav Schachter, Ph.D.  
Donald Shelby, Ph.D.

## **Associate Professors**

Conrad P. Caligaris, Ph.D.  
Bruce Cohen, Ph.D.  
Ernest M. DeCicco, Ph.D.

Harold M. Goldstein, Ph.D.  
Peggy Musgrave, Ph.D.

## **Assistant Professors**

Douglas Brown, Ph.D.  
Robert D. Cherry, Ph.D.  
David Kidder, Ph.D.  
James W. Meehan, Ph.D.

## **Instructors**

David Anderson, M.A.  
Craig Coelen, M.A.  
Fred Dunbar, M.A.  
Harvey Lapan, M.A.  
Steven Swanson, M.A.

## **Admission**

In addition to the admission requirements listed on page 23 applicants should have had a minimum of 12 semester hours of economics, or the equivalent, of which three semester hours, or the equivalent, should be statistics. Applications for admission to the fall quarter will be given equal consideration if received by August 30.

## **THE MASTER'S DEGREE**

Forty quarter hours of academic work are required. This program comprises 16 quarter hours of required core course work and 24 quarter hours of electives of which a minimum of twelve quarter hours must be selected from one of the economic fields listed below. The required core courses must be completed as soon as possible. With the approval of the graduate adviser, a maximum of six quarter hours may be elected from graduate courses offered by other departments, or one advanced undergraduate course in economics carrying three quarter hours of graduate credit.

## **Comprehensive Examination**

A comprehensive examination which will be held in accordance with the general graduate school regulations must be taken by all students.

## Master's Thesis

A master's thesis for nine quarter hours of credit is optional with the approval of the graduate adviser. Approval will be granted only in those instances in which previous graduate work of the student indicates capacity for independent study.

## Required Core Courses

The required core courses are:

	<b>Credits</b>
39.9A2 Microeconomic Theory I* .....	4
39.9A3 Macroeconomic Theory I* .....	4
39.9D3 Mathematics for Economists** .....	4
39.9E1 Statistical Inference .....	4

## Economic Fields

Available economic fields are listed below. Under each field are stated the required field courses and the elective field courses. Students must take at least twelve quarter hours in one field of concentration. In all fields the first listed required course in the field ordinarily should be taken first by the student majoring in the field. For students not majoring in the field, courses in the field may be taken in any sequence.

### Manpower Economics

Required field courses:

39.9G1	Economics of the Labor Market and Labor Force
39.9H5	Seminar in Human Resources Development

Elective field courses:

39.9G6	Economics of Manpower Planning I
39.9G7	Economics of Manpower Planning II
39.9G9	Public Policies in Manpower
39.9H1	Economics of Health Care and Welfare

### Development Economics

Required field courses:

39.9L3	Economic Development
39.9L5	Comparative Economic Development

Elective field courses:

39.9L1	Economics of Growth
39.9L7	Public Policies for Economic Development
39.9J1	Regional Economics
39.9J5	Regional Planning

\* Candidates deficient in intermediate theory may not be admitted into these core courses until they have completed 39.9A0 and/or 39.9A1.

\*\* New candidates must take a mathematics examination given by the department during registration period. Those who fail may not enroll in 39.9D3 until they have completed 39.9D0.

**Monetary Economics**

Required field courses:

- 39.9N0 Monetary Theory
- 39.9N4 Monetary Policy

Elective field courses:

- 39.9J8 Fiscal Aspects of Urban-Regional Development
- 39.9L1 Economics of Growth
- 39.9P5 Fiscal Policy and Debt Management

**Regional-Urban Economics**

Required field courses:

- 39.9J1 Regional Economics
- 39.9M1 Economics of Urban Affairs

Elective field courses:

- 39.9H1 Economics of Health Care and Welfare
- 39.9J5 Regional Planning
- 39.9J8 Fiscal Aspects of Urban-Regional Development
- 39.9M3 Topics in Urban Economics

**Quantitative Electives**

The department does not now offer a field in Quantitative Economics; however, the following courses are available as non-field electives:

- 39.9E5 Economic Programming
- 39.9E7 Principles of Econometrics
- 39.9E9 Advanced Quantitative Techniques
- 5.913 Data Processing (offered by the College of Engineering)

**DESCRIPTION OF COURSES**

*All courses carry three quarter hours of credit unless otherwise specified.*

**39.9A0 Introduction to Intermediate Microeconomic Theory**

Intensive coverage of microeconomic theory. *This course offers no credit toward a degree in economics.*

**39.9A1 Introduction to Intermediate Macroeconomic Theory**

Intensive coverage of macroeconomic theory. *This course offers no credit toward a degree in economics.*

**39.9A2 Microeconomic Theory (4 q.h.)**

Nature of economic theory and models. Analysis of consumer behavior. Costs and production functions. Market structures and equilibrium of firm.

**39.9A3 Macroeconomic Theory (4 q.h.)**

Income and employment theory; classical, Keynesian, and post-Keynesian aggregate demand and supply systems.

**39.9D0 Introduction to Mathematics for Economists (4 q.h.)**

This course acquaints the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus (meets four hours a week). *This course offers no credit toward a degree in economics.*

**39.9D3 Mathematics for Economics (4 q.h.)**

Application of matrix algebra and simple multivariate calculus to economic analysis. Static organization and dynamic analysis, difference and differential equations. Examples from economic theory. *Prep. 39.9D0 or mathematics examination.*

**39.9E1 Statistical Inference (4 p.h.)**

Estimation of population values and testing hypotheses. Classical estimation and testing compared to Bayesian Probability. Topics covered include the normal, t, binomial, Poisson, hypergeometric, exponential,  $X^2$ , F, and other probability distributions and the design of sample surveys. *Prep. 39.9D3 or consent of instructor.*

**39.9E5 Economic Programming**

Economic programming with emphasis on linear programming, including the transportation and simple problems, and simulation and queuing theory with applications to the computer. *Prep. 39.9D3.*

**39.9E7 Principles of Econometrics**

General regression models and associated problem areas such as identification and estimation.

**39.9E9 Advanced Quantitative Techniques**

Simultaneous equation, estimation, auto-correlation, Monte Carlo studies. Readings and applied economic research.

**5.913 Data Processing**

A study of digital computers and computer programming techniques. The FORTRAN language is utilized for programming and running several projects.

**39.9G1 Economics of the Labor Market and Labor Force**

Macro- and micro-analysis of labor supply and demand. Labor force measurement and change. Functioning of labor markets. Labor allocation. Wage and employment determination. Changes in the composition of labor demand. Impact of technological change. Unemployment. Income distribution and poverty.

**39.9G6 Economics of Manpower Planning I**

Analysis and evaluation of manpower planning techniques and policies. Macro- and micro-methods. The role of education and training. Integration of manpower planning with general development planning. Relationship of different methods to economic, political, and social conditions.

**39.9G7 Economics of Manpower Planning II**

Application of planning tools to problems of national economic development. Evaluation of methods and predictions used in national manpower plans.

**39.9G9 Public Policy in Manpower**

Analysis and evaluation of national manpower programs and their implementation on the local level. Relationships between public policy and policies of employers and unions; relationships between programs at different levels of government.

**39.9H1 Economics of Health Care and Welfare**

Theoretical basis, historical development, and institutional framework of problems involved in medical economics, income supplements and security, and the respective corrective policies. The manpower problems associated with health and welfare.

**39.9H5 Seminar in Human Resources Development**

Selected topics on the development and use of human resources.

**39.9J1 Regional Economics**

Delineating regions. Theories of location for firms, industries, and people. Regional income accounting systems, and models of intra- and inter-regional income determinants and impact analysis.

**39.9J5 Regional Planning**

Economic models for regional development. Planning techniques such as input-output analysis, nonlinear models, simulation techniques, and feasibility studies.

**39.9J8 Fiscal Aspects of Urban-Regional Development**

Analysis of regional differentials in fiscal capacities and needs. Federal-state-local measures to provide a better balance, including such devices as tax credits, revenue-sharing, grants, and re-allocation of expenditure functions. Consideration of appropriate fiscal governmental units especially in relation to metropolitan areas.

**39.9L1 Economics of Growth**

Identification and measurement of sources of aggregate and regional growth. Interregional growth patterns. National and regional growth projections and policies.

**39.9L3 Economic Development**

A study of the prospects of economic growth in less developed areas. Measurement and theories of economic development. Role of human and natural resources, education, technology, and capital formation in national, regional, and sectoral development. Changes in institutions.

**39.9L5 Comparative Economic Development**

Comparison of economic systems in different stages of economic development as exemplified by Yugoslavia, southern Italy, Turkey, the Middle East, and China.

**39.9L7 Public Policies for Economic Development**

Role of public sector in development. Public and private sectors. Planning at the national, regional, project, and plant level; cost-benefit; input-output analysis.

**39.9M1 Economics of Urban Affairs**

Problems of intra-metropolitan development — the economics of housing, transportation, environmental quality, discrimination, sprawl, and crime.



**39.9M3 Topics in Urban Economics**

Selected topics in urban economics.

**39.9N1 Monetary Theory**

A study of money and money flow models and theories of the demand for money and velocity.

**39.9N4 Monetary Policy**

The interrelationships among financial markets, central banking, and monetary policy.

**39.9P5 Fiscal Policy and Debt Management**

Role of the public sector in macroeconomics. Effect of the tax and expenditure structure through its built-in effects, as well as the use of discretionary fiscal policy measures upon economic stability and growth. National and regional impact of such policy measures. Problems of debt management and its relation to monetary policy.

**39.9Z1 Master's Thesis Seminar (9 q.h.)**

Thesis supervision by members of the department.

**39.9Z2 Readings in Economics (1 q.h.)**

Supervised reading in selected topics in economics.

# english

## **Professors**

Paul C. Wermuth, Ph.D.,

Chairman

James T. Barrs, Ph.D.

Victor E. Howes, Ph.D.

Samuel French Morse, Ph.D.

Reva Stump, Ph.D.

## **Associate Professors**

Arthur J. Weitzman, Ph.D.,

Director of Graduate Studies

Robert J. Blanch, Ph.D.

Raymond E. Blois, Ph.D.

M. X. Lesser, Ph.D.

Stanley J. Trachtenberg, Ph.D.

## **Assistant Professors**

Samuel J. Bernstein, Ph.D.

Andrew Dillon, Ph.D.

John Kazantzi, Ph.D.

James F. McArdle, M.A.

Jane A. Nelson, Ph.D.

Martin L. Robbins, Ph.D.

Joseph E. Westlund, Ph.D.

Richard Yoder, Ph.D.

## **THE MASTER'S DEGREE**

The Department of English offers a program leading to the M.A. degree. The courses emphasize training in research and criticism in the fields of English and American literature, and they provide the student the comprehensive background necessary for a career as a scholar, teacher, and writer.

## **Admission**

Applicants are judged favorably if they do superior work in their undergraduate preparation and do significantly better than average in the verbal and advanced sections of the Graduate Record Examination, the scores of which are required before an application will be considered. An applicant is expected to have had at least 24 semester credits in English beyond the freshman level and have achieved a 3.0 average in English courses on a 4 point scale. Recommendations should be submitted by former English professors. An applicant who is deficient in any one of these areas may be admitted as a provisional student.

The category of special student is provided for those nondegree students who wish to take a summer course or those already enrolled

in a graduate program in another institution who wish to transfer credit. A holder of a graduate degree in English may also enroll as a special student.

### **Program**

Forty-two quarter hours of academic work are required. The course work must include 30.8A1, Bibliography and Literary Historiography, which should be taken as soon as the student enters the program. Required also are three hours from courses in Group II; three hours from courses in Group III; and three hours from courses in Group IV; three hours from courses in Group V; and fifteen hours in designated seminars, which are limited in enrollment to twelve students. The remaining twelve hours may be elected from any courses in the program.

### **Transfer Credit**

A student may transfer from another institution no more than 12 quarter hours (9 semester hours) of graduate credit in English. Within this limit, graduate courses in other fields may also be transferred if their relevance to the student's specialized interest can be demonstrated. In every case, a petition for graduate credit must be sent to the Director of the Graduate School of Arts and Sciences with a copy of an official transcript.

### **Thesis**

A thesis is optional. A student wishing to write a master's paper must secure the approval of a graduate faculty member and write the thesis under the supervision of his advisor. Six credits in lieu of course work are allowed. The student must enroll in 30.9Z1, Thesis, to obtain credit. Papers must conform to the guidelines laid down in the *MLA Style Sheet*.

### **Comprehensive Examination**

A three-hour comprehensive examination is required. It will be given during the fall and spring quarters. Copies of previous examinations are available in the graduate director's office. A student must accrue 30 quarter hours of credit before he is eligible to take the examination. The examination may be taken only twice.

### **Language Requirement**

Normally a degree candidate must pass a reading examination in French or German or Latin. Substitutions must have the approval of the graduate director. Exemption from the examination may be obtained by submitting evidence of having passed with at least a grade of C an *advanced* undergraduate language course carrying six credits.

## DESCRIPTION OF COURSES

*All courses carry three quarter hours of credit unless otherwise specified.*

### GROUP I

(three quarter hours required)

#### **30.8A1 Bibliography and Literary Historiography**

Materials and techniques of research in English and American literature; bibliography, form, and content of papers and theses; problems of literary history.

### GROUP II

(three quarter hours required)

#### **30.8B1 Theories of Criticism**

A survey of the traditional schools of literary criticism from Plato to the present. *Course may not be used to satisfy group requirement.*

#### **30.8C1 Historical Linguistics I**

Written records; the classification of language; phonetics and phonetic change; the comparative method; dialect geography.

#### **30.8C2 Historical Linguistics II**

Continuation of 30.8C1. Fluctuation; analogic and sematic change; cultural, intimate, and dialect borrowing. *Prep. 30.8C1.*

#### **30.8C4 Semantics**

The relation between language and behavior; the concept of change, variety, and uniqueness; symbols; levels of abstraction; habits of evaluation of linguistic phenomena; and modification of such habits in the direction of human adjustment, understanding, and survival.

#### **30.8C5 History of the English Language I**

The nature and origin of language; ancestry and early growth of English; phonetics, sound-change, and history of English sounds; history of English inflections; sources of the vocabulary; the making of words.

#### **30.8C6 History of the English Language II**

Semantic change; syntax and usage; dictionaries, spelling, pronunciation, variations, and usage. *Prep. 30.8C5.*

#### **30.8D1 Introduction to Old English**

#### **30.8D6 Chaucer I**

*Troilus and Criseyde*; Fragment 1, 2, and 7 of the *Canterbury Tales*, with particular attention to the tales of the Knight, the Shipman, the Prioress, and the Priest.

#### **30.8D7 Chaucer II**

Fragments 3, 4, 5, 6, 8, 9, and 10 of the *Canterbury Tales*, with particular attention to the tales of the Wife of Bath, the Clerk, the Merchant, the Pardoner, and the Manciple. *Prep. 30.8D6.*

**GROUP III****(three quarter hours required)****30.8E1 Tudor Literature**

Major prose and poetry of the sixteenth-century, excluding the drama.

**30.8E4 Renaissance Drama****30.8F1 Seventeenth-Century Literature**

Metaphysical and Cavalier Poetry, Bacon, Burton, and Browne.

**GROUP IV****(three quarter hours required)****30.8G1 Restoration and Early Eighteenth-Century**

A critical study of Augustan poetry: The poetry of Dryden, Rochester, Butler, Pope, Gay, and Swift. Three Restoration plays will be read.

**30.8G6 Age of Johnson**

The poetry of Gray, Smart, and Burns; the works of Johnson and Boswell.

**30.8H1 Romanticism****30.8J1 Victorian Literature****30.8K1 Twentieth-Century British Literature***Course may not be used to satisfy group requirement.***GROUP V****(three quarter hours required)****30.8L1 Colonial American Literature****30.8M1 Nineteenth-Century American Literature****30.8N1 Twentieth-Century American Literature**

Henry Adams, Stephen Crane, John Dos Passos, and F. Scott Fitzgerald.

**SEMINARS****(Fifteen quarter hours of seminar courses are required, of which three credits must be in a pre-nineteenth-century period.)****30.9B1 Critical Schools****30.9B3 English Prose****30.9B5 Comic Drama**

The Comic Spirit and its manifestations in dramatic literature and performance. The nature and forms of comic playwriting from Aristophanes to the present. An examination of the theater's comic forms: farce, comedy, satire, parody.

**30.9B6 Tragic Drama**

The nature of tragic drama based on the study of plays and theories. An examination of the various ancient and modern attitudes toward the problems of tragedy.

**30.9B7 Theatrical Styles**

An examination of the realistic-naturalistic, expressionistic, and experimental theatrical styles.

**30.9C2 Descriptive Linguistics**

Transformational and generative grammar.

**30.9D1 Beowulf**

*Prep. 30.8D1*

**30.9D2 Old English Poetry**

*Prep. 30.8D1*

**30.9D8 Studies in Fourteenth-Century Literature**

Major works in Middle English including *Sir Gawaine and The Green Knight*, *The Pearl*, and *Piers Plowman*.

**30.9E1 Studies in Renaissance Poetry**

Sonnet sequences will be emphasized.

**30.9E4 Jacobean Drama**

**30.9E5 Shakespeare's Histories**

**30.9E6 Shakespeare's Tragedies**

**30.9E7 Shakespeare's Comedies**

**30.9E8 Problems of Shakespearean Interpretation**

**30.9F1 Metaphysical Poetry**

**30.9F4 Seventeenth-Century Thought**

**30.9F6 Milton's *Paradise Lost***

**30.9F7 Milton's Minor Poetry and Prose**

**30.9G2 Restoration and Eighteenth-Century Drama**

**30.9G3 Augustan Literature**

Jonathan Swift.

**30.9G5 Intellectual Prose of the Eighteenth-Century**

**30.9G7 Eighteenth-Century Novel**

Fielding, Richardson, Smollett, and Sterne.

**30.9G8 Individual Eighteenth-Century Novelist****30.9H1 Romantic Poetry I**

The Lake School: Wordsworth, Coleridge, and Southey.

**30.9H2 Romantic Poetry II**

Byron, Keats, and Shelley.

**30.9H3 Problems of Romanticism**

Theoretical and historical concepts of Romanticism; defining imagination; the transition to Romanticism; critical readings of the Romantic poets.

**30.9J1 Victorian Poetry I****30.9J2 Victorian Poetry II****30.9J5 Intellectual Prose of the Victorian Age****30.9J7 Victorian Novel**

Dickens, Thackeray, Eliot, Hardy, and Trollope.

**30.9J8 Individual Victorian Novelist**

George Eliot.

**30.9K1 Early Twentieth-Century British Poetry****30.9K7 Twentieth-Century British Novel****30.9K8 Individual Modern British Novelist****30.9K2 Contemporary British Poetry**

Post World War II trends.

**30.9K4 The Irish Renaissance in the Twentieth Century****30.9L1 Puritanism**

Edward Taylor and Jonathan Edwards.

**30.9L2 Eighteenth-Century American Literature****30.9M1 Transcendentalism**

Mainly Emerson and Thoreau.

**30.9M2 Nineteenth-Century American Poetry**

Walt Whitman.

**30.9M7 The Romance in America**

Hawthorne's short fiction.

**30.9M8 The Rise of Realism**

An examination of Local Colorism, Realism, and Naturalism in the works of Twain, Howells, James, Dreiser, and Norris.

**30.9N1 Twentieth-Century American Poetry**

**30.9N2 Individual Modern American Poet**

Wallace Stevens.

**30.9N3 Contemporary American Poetry**

**30.9N7 Modern American Novel**

Nathaniel West, Ralph Ellison, John Hawkes, and John Barth.

**30.9N8 Individual American Novelists**

Norman Mailer and Saul Bellow.

**30.9N9 Modern American Drama**

**30.8R1, 30.8R2, 30.8R3 Advanced English**

An advanced course in the structure and idioms of English with particular emphasis on oral mastery of the language. *Not to be used toward degree requirements in the Graduate School of Arts and Sciences.*

**30.9Z1 Thesis (maximum: 6 q.h.)**

**30.9Z2 Directed Research**



# history

## Professors

Raymond H. Robinson, Ph.D.,  
Chairman  
Wallace P. Bishop, Ph.D.  
Robert A. Feer, Ph.D.

## Associate Professors

Philip N. Backstrom, Jr., Ph.D.  
Martha E. François, Ph.D.  
Norbert L. Fullington, Ph.D.  
Stanley R. Stembridge, Ph.D.

## Assistant Professors

Donald R. Allen, Ph.D.  
Ruth T. Anderson, Ph.D.  
Ballard C. Campbell, Ph.D.  
Donald M. Jacobs, Ph.D.  
John D. Post, Ph.D.

## Lecturer

Helen S. Frothingham, M.A.

## Instructors

Suzanne L. Hamner, M.A.  
Gerald H. Herman, M.A.  
Martin R. Ring, M.A.

## THE MASTER'S DEGREE

### Admission

In addition to the admission requirements listed on page 23, applicants must have had a program which includes at least 15 semester hours of history. Applicants for the fall quarter who submit their application and all supporting documents by March 15 will be notified on or about April 1. Students who are interested in financial assistance *must* file all material by March 15.

### Program

Forty-two quarter hours of academic work are required. The course work must include 23.800, Methodology; 23.801, European Historiography; 23.900, American Historians; and two courses specifically labeled seminar, except that students who write a thesis will be required to take only one seminar. Students enrolling in seminars must have time available for research in libraries.

Full-time students take four courses each quarter, thereby completing 36 quarter hours during the fall, winter, and spring quarters. The remaining credits may be taken during the summer session preceding or following the normal academic year.

For all students the distribution of courses must be such that not more than 24 quarter hours are taken in either Group I or Group II.

**GROUP I — EASTERN HEMISPHERE**

- 23.800 Methodology
- 23.801 European Historiography
- 23.802 Ancient Greece
- 23.803 Ancient Rome
- 23.806 Intellectual History of Europe, 1688–1789
- 23.807 Intellectual History of Europe, 1789–1870
- 23.808 Intellectual History of Europe, 1870–1950
- 23.809 Seminar in European Intellectual History
- 23.810 Social and Economic History of Europe, 400–1450
- 23.811 Social and Economic History of Europe, 1450–1650
- 23.812 Seminar in Social and Economic History of Europe, 1650–1850
- 23.813 Economic History of Europe since 1850
- 23.817 Medieval Institutions
- 23.818 Seminar in the Renaissance
- 23.820 The Renaissance
- 23.821 The Reformation
- 23.826 English Medieval Constitutional History
- 23.827 Seminar in England, 1558–1660
- 23.830 British History, 1688–1815
- 23.831 British History, 1815–1914
- 23.832 Seminar in Twentieth-Century Britain
- 23.833 Seminar in Nineteenth-Century Britain
- 23.835 France, 1180–1661
- 23.836 France, 1661–1830
- 23.840 France and Germany, 1870–1918
- 23.841 France and Germany since 1918
- 23.842 Seminar in Modern France
- 23.845 Seminar in Nineteenth-Century Europe
- 23.850 Seminar in Russian History
- 23.855 European Socialist Thought
- 23.860 Diplomatic History of Europe, 1815–1914
- 23.862 Twentieth-Century Europe
- 23.863 Seminar in Twentieth-Century Europe
- 23.870 China to 1800
- 23.871 Modern China
- 23.872 Communism in China
- 23.873 Japan to 1600
- 23.874 Japan, 1600–1868
- 23.875 Modern Japan
- 23.881 Modern Africa
- 23.884 Modern Middle East

**GROUP II — WESTERN HEMISPHERE**

- 23.900 American Historians
- 23.901 Recent Interpretations of American History
- 23.905 Colonial America: The Seventeenth Century
- 23.906 Colonial and Revolutionary America: The Eighteenth Century
- 23.909 Seminar in Colonial and Revolutionary America
- 23.910 American Social History, 1607–1815

- 23.911 American Social History, 1815–1900
- 23.912 American Social History, 1900–1950
- 23.913 American Intellectual History, 1750–1865
- 23.914 American Intellectual History since the Civil War
- 23.915 Seminar in American Intellectual History
- 23.917 American Cultural History
- 23.918 Seminar in American Cultural History
- 23.920 Seminar in American Urban History
- 23.925 Seminar in American Economic History
- 23.930 The Westward Movement in the United States in the Nineteenth Century
- 23.931 Man and Land in the United States in the Twentieth Century
- 23.935 Seminar in Recent American History
- 23.937 American Politics, 1787–1892
- 23.938 American Politics since 1892
- 23.939 Seminar in American Political History
- 23.941 American Diplomatic History, 1775–1889
- 23.942 American Diplomatic History since 1889
- 23.943 Seminar in American Diplomatic History
- 23.961 Historical Preservation
- 23.967 Afro-American History I
- 23.968 Afro-American History II
- 23.969 Seminar in Afro-American History
- 23.970 The United States and the Caribbean Region
- 23.971 Mexican History
- 23.973 South America to 1900
- 23.974 South America since 1900
- 23.975 Seminar in South American History

With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of 12 quarter hours may be elected from advanced undergraduate courses in history.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries nine quarter hours of credit. The thesis will count as Eastern or Western credits, depending on the subject.

### **Comprehensive Examination**

All degree candidates must pass a comprehensive examination.

### **Language Requirement**

Proficiency must be demonstrated in a foreign language to be approved by the department.

## **DESCRIPTION OF COURSES**

*All courses carry three quarter hours of credit unless otherwise specified.*

### **23.800 Methodology**

The objectives, methods, and resources of the historian.

### **23.801 European Historiography**

The development of historical writing from ancient times to the present.

### **23.802 Ancient Greece**

Selected topics in the history of ancient Greece.

### **23.803 Ancient Rome**

Selected topics in the history of Rome in the period of the Republic or the Empire.

### **23.806 Intellectual History of Europe, 1688–1789**

The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas.

### **23.807 Intellectual History of Europe, 1789–1870**

The great age of liberal and nationalistic thought. Social problems created by industrialism and various proposals to solve these problems will be examined.

### **23.808 Intellectual History of Europe, 1870–1950**

The intellectual developments which have brought Europe to its present position in world affairs. Topics considered include theories of evolution, scientism, radical socialism, and fascism.

### **23.809 Seminar in European Intellectual History**

Research and writing on special topics in European intellectual history.

### **23.810 Social and Economic History of Europe, 400–1450**

Emergence of localism and manorialism in the early Middle Ages; commercial revival and town development in the twelfth and thirteenth centuries; economic decline and plague in the later Middle Ages.

### **23.811 Social and Economic History of Europe, 1450–1650**

Social structure, standards of living, and economic development in an age of exploration, renaissance, and reformation.

### **23.812 Seminar in Social and Economic History of Europe, 1650–1850**

Exploration of social and economic developments in the light of the "revolutions" (intellectual, political, agricultural, and industrial) which took place during this period.

### **23.813 Economic History of Europe since 1850**

Topical analysis of the economic development of modern Europe.

### **23.817 Medieval Institutions**

Political, economic, and religious institutions in England and France from the fourth to the thirteenth centuries.

### **23.818 Seminar in the Renaissance**

Research and writing in topics concerning the Renaissance.

### **23.820 The Renaissance**

European political and cultural life from the thirteenth to the seventeenth centuries, with attention to Humanism and to the rebirth of classicism in literature and the arts.

### **23.821 The Reformation**

The development of the Christian Church from the thirteenth to the seventeenth centuries, with attention to the conflict between church and state, the impact of the Renaissance, the rise of the Protestant sects, and the wars of religion.

**23.826 English Medieval Constitutional History**

A study of the traditions and institutions which contributed to the development of common law and parliamentary government from the time of Alfred through the reign of Henry VIII.

**23.827 Seminar in England, 1558–1660**

A study of political, religious, social, and economic problems from Elizabeth I to the Restoration.

**23.830 British History, 1688–1815**

The great constitutional and parliamentary developments in Britain from the Glorious Revolution to Waterloo, with attention to social and economic aspects of the same period.

**23.831 British History, 1815–1914**

The age of Pax Britannica, with emphasis on the growth of democracy, social reform and socialism, and Victorian society and culture.

**23.832 Seminar in Twentieth-Century Britain**

The seminar will focus on British political parties in the 1930's, with special emphasis on the development of their foreign policies.

**23.833 Seminar in Nineteenth-Century Britain**

Liberalism, conservatism, and the progress of the English people will be the theme of the seminar.

**23.835 France, 1180–1661**

The history of France from the time of Philip II to the majority of Louis XIV with special emphasis on the problems of cultural, political, and economic unity and the effects of the Renaissance and the Reformation.

**23.836 France, 1661–1830**

A study of the "Old Regime," including an examination of the reign of Louis XIV, the decline of the French monarchy in the eighteenth century, and the general effects of the Enlightenment; an analysis of the revolutionary period, 1789 to 1830.

**23.840 France and Germany, 1870–1918**

The rise of Germany as the dominant power in Europe in 1870–71, with attention to French attempts to regain power and German attempts to maintain and extend influence.

**23.841 France and Germany since 1918**

The continuing struggle of France and Germany for European hegemony in the light of new theories and new international factors.

**23.842 Seminar in Modern France**

Research and writing in the history of France between the world wars.

**23.845 Seminar in Nineteenth-Century Europe**

Research and writing in European history from 1850 to 1900.

**23.850 Seminar in Russian History**

A narrow period or special topic in Russian history. *The course presupposes a basic knowledge of Russian history and will require extensive work on a research paper.*

**23.855 European Socialist Thought**

Studies in the history of socialism from the early nineteenth-century utopias to the New Left.

**23.860 Diplomatic History of Europe, 1815–1914**

The foreign policies of the chief European powers, with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international cooperation.

**23.862 Twentieth-Century Europe**

The political history of Europe since 1900, with attention to World War I, the rise of Communism and Fascism, the struggle for security in the western democracies, World War II, and the Cold War.

**23.863 Seminar in Twentieth-Century Europe**

A study of selected political controversies in Europe since 1900.

**23.870 China to 1800**

History of Chinese civilization from antiquity through Confucianism to the period of Western impact.

**23.871 Modern China**

Revolution and institutional change in China from the nineteenth century to 1927.

**23.872 Communism in China**

A study of the Chinese Communist movement from its origins in the 1920's to the present.

**23.873 Japan to 1600**

A survey of early Japanese history with special emphasis on the social, political, intellectual, and literary history of the medieval period.

**23.874 Japan, 1600–1868**

A study of the Tokugawa period, emphasizing the problems of late feudal control, urban and rural developments, social, intellectual, and literary history.

**23.875 Modern Japan**

The history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

**23.884 Modern Middle East**

A study of the Middle East in the twentieth century.

**23.900 American Historians**

The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

**23.901 Recent Interpretations of American History**

The literature of American history since 1945.

**23.905 Colonial America: The Seventeenth Century**

Exploration of the New World, settlement of the English North American mainland colonies, and the adaptation of European institutions and ideas to New World conditions.

**23.906 Colonial and Revolutionary America: The Eighteenth Century**

The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England.

**23.909 Seminar in Colonial and Revolutionary America**

Research and writing on some topic in American history prior to 1789.

**23.910 American Social History, 1607–1815**

The ethnic foundation of American society; the ways Americans made their living, and the ways in which they lived during the colonial and early national periods.

**23.911 American Social History, 1815–1900**

The King Cotton society of the South, the ferment of reform and industrialism in the North, the Civil War, and the materialistic civilization of the late nineteenth century.

**23.912 American Social History, 1900–1950**

The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

**23.913 American Intellectual History, 1750–1865**

American attitudes toward the individual and toward government during the Enlightenment, the romantic movement, and the slavery controversy.

**23.914 American Intellectual History since the Civil War**

The adaptation of the ideas of an agricultural society to the conditions of an urban and industrial society.

**23.915 Seminar in American Intellectual History**

The seminar will focus upon a single figure in American intellectual history. His writings and writings about him will be analyzed.

**23.917 American Cultural History**

The transplanting of European culture and the development of an American culture.

**23.918 Seminar in American Cultural History**

Research and writing on some aspect of American culture.

**23.920 Seminar in American Urban History**

The political, economic, and social history of America's major cities, with special emphasis on Boston's last century.

**23.925 Seminar in American Economic History**

The development of the American economy from 1800 to the present, with special attention to the history of transportation. Topics include the development of highways, canals, railroads, and airlines, with an examination of the roles of private enterprise and government.

**23.930 The Westward Movement in the United States in the Nineteenth Century**

Westward migration into the various geographic provinces will be traced, with emphasis upon its causes, processes, and its economic and political influences. Economic aspects stressed will be those relating to the land: agriculture, mining, lumbering, and grazing.

**23.931 Man and Land in the United States in the Twentieth Century**

Aspects of land use in America since the closing of the frontier, with attention to agriculture and mining and to conservation programs.

**23.935 Seminar in Recent American History**

Special topics from the period 1896 to 1960 will be studied in detail, and students will present a research paper on a major person, action, or movement.

**23.937 American Politics, 1787-1892**

The political history of the United States from the Constitution to Populism.

**23.938 American Politics since 1892**

Party alignments in the twentieth century.

**23.939 Seminar in American Political History**

Research and writing on some aspect of American politics.

**23.941 American Diplomatic History, 1775-1889**

The history of American foreign policy and foreign relations from the American Revolution to 1889.

**23.942 American Diplomatic History since 1889**

The United States in the age of world involvement and responsibility; the imperialistic episode; the world wars; international organizations and alliances.

**23.943 Seminar in American Diplomatic History**

Research and writing on selected topics in the history of American foreign relations.

**23.961 Historical Preservation**

An introduction to various aspects of the preservation movement, including planning and administration of projects.

**23.967 Afro-American History I**

The history of Afro-Americans to 1900, with emphasis on the role of black men in slavery and freedom.

**23.968 Afro-American History II**

The history of Afro-Americans since 1900.

**23.969 Seminar in Afro-American History**

Research and writing on some aspect of Afro-American history.

**23.970 The United States and the Caribbean Region**

The Caribbean policy of the United States from the Monroe Doctrine to the Alliance for Progress.

**23.971 Mexican History**

The making of modern Mexico from its Indian and Spanish beginnings to the present.

**23.973 South America to 1900**

The European impact on South America, the movements for independence, and the nineteenth-century history of the new republics.

**23.974 South America since 1900**

The internal developments of the South American republics and their relations with one another and with other nations in the twentieth century.



**23.975 Seminar in South American History**

Research and writing on special topics in the history of the South American republics.

**23.990 Assigned Reading in History (1 q.h.)**

Assigned reading under supervision of a faculty member.

**23.991 Thesis (9 q.h.)**

Thesis supervision by members of the department.

# mathematics

## Professors

Robert A. Bonic, Ph.D.  
Bohumil Cenk, D.Sc.  
Holland C. Filgo, Jr., Ph.D.  
Arshag Hajian, Ph.D.  
Flavio B. Reis, Ph.D.  
Giuliano Sorani, Laurea  
Gabriel Stolzenberg, Ph.D.  
Harold L. Stubbs, Ph.D.  
Jack Warga, Ph.D.

## Associate Professors

David I. Epstein, Ph.D.  
Acting Chairman, 1970-1971  
Alberto R. Galmarino, Ph.D.  
Chelikuzhiel T. John, Ph.D.  
Robert D. Klein, M.S.  
Thomas O. Sherman, Ph.D.  
Victor R. Staknis, Ph.D.

## Assistant Professors

Samuel J. Blank, Ph.D.  
Mark Bridger, Ph.D.  
John Frampton, Ph.D.  
Charles J. Freifeld, Ph.D.  
Maurice E. Gilmore, Ph.D.  
Eugene Gover, Ph.D.  
Lawrence C. House, M.A.  
Keith B. Josephson, Ph.D.  
Nancy J. Kopell, Ph.D.  
Richard A. Rasala, Ph.D.  
Clyde Schechter, Ph.D.

## Instructors

Stanley Ocken, Ph.D.

## Lecturers

Kurt Arbenz, Ph.D.  
Albert Arcese, M.A.  
Michael E. Ash, Ph.D.  
Edward C. Crowley, M.S.  
Philip Davis, M.A.  
David Gootkind, M.S.  
David Harris, M.S.  
Chung-wu Ho, M.A.  
Irving Kanter, Ph.D.  
Walter E. Knabe, Ph.D.  
Ira Kohlberg, Ph.D.  
Carlton G. Lehr, M.S.  
Leonard Lesensky, Ph.D.  
Jack Mettauer, M.A.  
James Misho, A.M.  
I. Larry Morris, Ph.D.  
Peter P. Philliou, M.S.  
Lawrence Rosenfeld, Ph.D.  
Harry A. Rothmann, M.S.  
Elias Sefchovich, Ph.D.  
George C. Sethares, Ph.D.  
Rocco Urbano, M.A.  
Neal T. Watson, M.A.  
David M. Waxman, M.S.  
Lawrence Wiley, M.S.  
Lee A. Young, Ph.D.

## Admission

In addition to the admission requirements listed on page 23, applicants should have a background which includes courses in linear and modern algebra and mathematical analysis.

## THE MASTER'S DEGREE

### Full-Time Program

Forty hours of course work are required for the degree. The following courses are required.

	Credits
10.9A1 Basic Analysis and Topology .....	4
10.9A2 Algebra A .....	4
10.9A3 Integration .....	3
10.9A4 Algebra B .....	3
10.9A5 General Topology .....	3
10.9A6 Complex Variables .....	4
10.9A7 Geometry .....	4
	<hr/> 25

The remaining 15 credits required for the master's degree may be selected from any graduate mathematics courses with the approval of the student's faculty adviser. In some cases, courses in other departments may be approved.

A full-time candidate for the master's degree will normally take the courses listed above in the first year of graduate study, according to the following schedule:

Fall Quarter	Credits	Winter Quarter	Credits
10.9A1 Basic Analysis and Topology .....	4	10.9A3 Integration .....	3
10.9A2 Algebra A .....	4	10.9A4 Algebra B .....	3
		10.9A5 General Topology ..	3
Spring Quarter	Credits		
10.9A6 Complex Variables ..	4		
10.9A7 Geometry .....	4		

### Part-Time Program

Students in this program may progress according to their abilities and the time available. If students are deficient in any of the mathematics courses required for admission to the degree program, they will be required to satisfy their deficiencies by taking courses given for this purpose. Such courses will carry graduate credit, but the credit will be in addition to the regular degree requirements. The following courses are required:

	Total Credits
10.8C1 General Topology I .....	2
10.8D1, 10.8D2 Theory of Functions of a Real Variable I, II	4
10.8J1, 10.8J2, 10.8J3 Theory of Functions of a Complex Variable I, II, III .....	6
10.8P1, 10.8P2, Algebra I, II .....	4
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The remaining 24 quarter hours may be selected from graduate mathematics courses. With the approval of the department, a maximum of 10 of these elective credits may be selected from courses in other depart-

ments in the Graduate School of Arts and Sciences or the Graduate School of Engineering.

### **Other Requirements**

There is no comprehensive examination and no language requirement for the master's degree. A thesis is not required but may in some cases be substituted for an elective course with the approval of the department.

## **THE DOCTOR OF PHILOSOPHY DEGREE**

### **Admission**

Students who have completed the first year of the full-time master's degree program are eligible to take the qualifying examination for admission to doctoral candidacy. A student admitted to full-time study who has completed the requirements for the master's degree at another institution will take the qualifying examination at a date to be set by the departmental graduate committee.

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations.

### **Qualifying Examination**

This examination for admission to doctoral candidacy will test the student's understanding of the basic material of algebra, analysis, and topology covered in the first-year courses of the full-time master's degree program.

### **Course Requirements**

The course requirements, in addition to the minimum master's degree requirements of 40 quarter hours of credit, are established by the departmental graduate committee for each candidate. In most cases, 40 quarter hours of additional work will be required.

### **Minor Specialty**

Each doctoral candidate will select some specific mathematical subject of an advanced nature and by means of reading, lecture courses, and/or seminars shall master the equivalent of one full year's course work in this area. Approval of the area in which the student intends to work should be obtained in advance from the Ph.D. committee. The topic must be reasonably far from that area in which the student plans to write a dissertation.

## Comprehensive Examination

This examination, normally taken in the student's third year of graduate study, will cover the major area in which the student plans to write his dissertation as well as the area of his minor specialty. Passing of this examination signifies that the student has completed all course requirements, and can now devote all his time to the dissertation. The comprehensive examination may be waived in individual cases at the discretion of the Ph.D. committee.

## Language Requirements

Ability to read and translate mathematical texts and journals in two foreign languages must be established by each candidate. The languages may be chosen from French, German, and Russian; any other choice requires special approval. The student should notify the chairman of the departmental graduate committee when he is prepared to be examined on each language. At least one language examination must be passed before beginning work on the dissertation. The examinations are conducted by members of the faculty of the mathematics department.

## Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

## Dissertation

After the successful completion of his comprehensive examination, each student shall select a dissertation adviser under whose guidance he will write his doctoral dissertation. If the student wishes it, the departmental graduate committee will assist him in the selection of a dissertation adviser. The dissertation itself must represent an original solution of a problem in the chosen area of mathematics which makes some contribution to mathematical knowledge.

## Final Oral Examination

This examination on the dissertation will be held in accordance with the graduate school regulations.

## DESCRIPTION OF COURSES

*The following courses are primarily for students in the engineering programs. These courses may not be used for credit toward the program in mathematics but may be taken in addition to the required course work in this field.*

**10.8A1 Advanced Mathematics I (2 q.h.)**

Series solution of differential equations; Legendre and Bessel functions; Laplace transforms; scalar and vector fields; gradient, divergence, and curl. *Prep. Differential Equations.*

**10.8A2 Advanced Mathematics II (2 q.h.)**

Fourier series and integrals, orthogonal functions, boundary-value problems involving partial differential equations: wave equation, heat flow, Laplace equation. *Prep. 10.8A1 or equivalent.*

**10.8A3 Advanced Mathematics III (2 q.h.)**

Matrix algebra, determinants, inversion of matrices, rank and equivalence, linear equations and linear dependence, vector spaces, and linear transformations. *Prep. 10.8A2.*

**10.8A4 Advanced Mathematics IV (2 q.h.)**

Further topics in matrices and vector spaces. *Prep. 10.8A3.*

*The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements in algebra and/or analysis. These courses will be taken in addition to the required course work in mathematics.*

**10.8B1, 10.8B2, 10.8B3 Abstract Algebra I, II, III (2 q.h.)**

Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. *Prep. Differential and Integral Calculus.*

**10.8B4 Advanced Calculus I (2 q.h.)**

Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem. *Prep. Differential and Integral Calculus.*

**10.8B5 Advanced Calculus II (2 q.h.)**

Functions of several independent variables. Distance and open sets; limits, continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations. *Prep. 10.8B4.*

**10.8B6 Advanced Calculus III (2 q.h.)**

Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals. *Prep. 10.8B5.*

*The following courses may be used toward the degree requirements in mathematics.*

**10.8C1, 10.8C2 General Topology I, II (2 q.h.)**

Sets and maps, metric spaces, topological spaces, separation axioms, compactness, connectedness. *Prep. 10.8B6 or equivalent.*

**10.8D1 Theory of Functions of a Real Variable I (2 q.h.)**

Lebesgue measure on real line, measurable functions, Lebesgue integral, convergence theorems, bounded variation, absolute continuity. *Prep. 10.8C1.*

**10.8D2 Theory of Functions of a Real Variable II (2 q.h.)**

Classical Banach spaces, integration theory on abstract measure spaces, signed measures, Radon-Nikodym theorem, product measure, Fubini theorem. *Prep. 10.8D1.*

**10.8E1 Advanced Differential Equations I (2 q.h.)**

First order differential equation; existence and uniqueness theorems; dependence of solution on parameter. Stability theory. Periodic solutions. *Prep. 10.8B6.*

**10.8E2 Advanced Differential Equations II (2 q.h.)**

Systems of first order differential equations. *Prep. 10.8E1.*

**10.8E3 Advanced Differential Equations III (2 q.h.)**

Selected topics, including asymptotic behavior of solutions. *Prep. 10.8E2.*

**10.8E4 Partial Differential Equations I (2 q.h.)**

Partial differential equations of first order; Cauchy-problem; Cauchy-Kowalewski theorem. Method of characteristics. *Prep. 10.8B6.*

**10.8E5 Partial Differential Equations II (2 q.h.)**

Classification of second order equations. Well-posed problems. Emphasis on hyperbolic equations. *Prep. 10.8E4.*

**10.8E6 Partial Differential Equations III (2 q.h.)**

Emphasis on elliptic equations. *Prep. 10.8E5.*

**10.8E7 Nonlinear Differential Equations (2 q.h.)**

Nonlinear differential equations of the first order; systems of differential equations; singular points and stability; second-order nonlinear equations; results of Poincaré and Lyapunov; problems in nonlinear mechanics. *Prep. 10.8E3.*

**10.8E8, 10.8E9 Integral Equations I, II (2 q.h.)**

Equations of Volterra and Fredholm. Symmetric kernels. Orthogonal systems of functions. Applications. *Prep. 10.8B6 or equivalent.*

**10.8F1 Difference Equations (2 q.h.)**

Formulation and solution of difference equations; approximate solution of engineering problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods; applications. *Prep. 10.8B6 or equivalent.*

**10.8F3, 10.8F4 Calculus of Variations I, II (2 q.h.)**

The concept of the first variation of a functional; the simplest variational problem; Euler's equation. Generalization to several variables. Hamilton-Jacobi theory. Sufficient conditions for extrema. Fields of extremals. Direct methods in variational problems. *Prep. 10.8B6.*

**10.8G1 Probability I (2 q.h.)**

Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem. *Prep. Differential and Integral Calculus.*

**10.8G2 Probability II (2 q.h.)**

Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains. *Prep. 10.8G1.*

**10.8G4 Mathematical Statistics I (2 q.h.)**

Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression. *Prep. 10.8G1 or equivalent.*

**10.8G5 Mathematics Statistics II (2 q.h.)**

Analysis of variance; further topics in statistical inference. *Prep. 10.8G4.*

**10.8G6 Estimation Theory I (2 q.h.)**

Review of probability with application to multidimensional random vectors. State space approach to dynamic systems with uncertainties. Estimation theory for static and dynamic linear systems based on Bayesian, maximum likelihood, minimum variance, Kalman-Bucy, and weighted least squares methods. Determination of optimal filter, predictor, smoother for discrete linear systems. *Prep. 10.8A4 and 10.8G1.*

**10.8G7 Estimation Theory II (2 q.h.)**

Determination of optimal filter, predictor, smoother for continuous linear systems. Review of stochastic processes with application to estimation theory. Estimation theory for static and dynamic nonlinear systems. Introduction to hypothesis testing. *Prep. 10.8G6.*

**10.8G8 Stochastic Processes I (2 q.h.)**

Probability spaces for an infinite family of random variables. Gaussian processes. Processes with independent increments. Strict and wide sense stationary processes. Ergodicity. Random harmonic analysis. *Prep. 10.8G2.*

**10.8G9 Stochastic Processes II (2 q.h.)**

Markov chains with discrete and continuous time parameter. Markov processes. Counting processes. Renewal processes. Queuing problems. *Prep. 10.8G8.*

**10.8J1 Theory of Functions of a Complex Variable I (2 q.h.)**

Geometry of the complex plane, analytic functions, Cauchy's theorem. *Prep. 10.8C1 (may be taken concurrently).*

**10.8J2 Theory of Functions of a Complex Variable II (2 q.h.)**

Infinite sequences and series, singularities, residues, applications *Prep. 10.8J1.*

**10.8J3 Theory of Functions of a Complex Variable III (2 q.h.)**

Meromorphic functions, Mittag-Leffler theorem, conformal mapping. *Prep. 10.8J2.*



**10.8L1 Numerical Analysis I (2 q.h.)**

Solutions of systems of linear algebraic equations by reduction and iterative methods. Solutions of algebraic and transcendental equations. *Prep. 10.8B6 or equivalent.*

**10.8L2 Numerical Analysis II (2 q.h.)**

Approximation and interpolation. Use of difference techniques in interpolation and quadrature. Approximation by series of orthogonal functions; rational approximation. *Prep. 10.8L1.*

**10.8L3 Numerical Analysis III (2 q.h.)**

Numerical solution of ordinary and partial difference equations with emphasis on stability and accuracy of solutions. *Prep. 10.8L2.*

**10.8L4 Linear Numerical Analysis I (2 q.h.)**

Vector space, Jordan canonical form, norms and seminorms, direct solution of linear systems, special systems, error analysis, iterative methods. *Prep. 10.8B1 and 10.8B6.*

**10.8L5 Linear Numerical Analysis II (2 q.h.)**

Acceleration of iterative methods, the eigenvalue and eigenvector problem. *Prep. 10.8L4.*

**10.8L6 Numerical Solution of Partial Differential Equations (2 q.h.)**

Applications of linear numerical analysis to the solution of partial differential equations. *Prep. 10.8L5.*

**10.8M1, 10.8M2 Approximation Theory I, II (2 q.h.)**

Various techniques for the approximation of given functions, including interpolation, rational approximation, and orthogonal functions. Applications to such problems as numerical integration and solution of differential equations. *Prep. 10.8B6.*

**10.8M4 Interpolation and Approximation (2 q.h.)**

Review of Taylor's theorem, elementary interpolation formulas, difference tables, Newton's formulas, lozenge diagram. Uniform approximation, Weierstrass theorem, Chebychev polynomials. Rational approximation, Padé table, Maehly's methods. *Prep. 10.8B6 or equivalent.*

**10.8M5 Approximation and Quadrature (2 q.h.)**

Least-squares approximation, orthogonal functions, properties of orthogonal polynomials. Trigonometric approximation, filtering and smoothing. Numerical integration schemes, including Newton-Cotes, Gaussian and Romberg methods. Introduction to Monte Carlo methods and evaluation of higher dimensional integrals. *Prep. 10.8M4.*

**10.8M6 Numerical Solution of Ordinary Differential Equations (2 q.h.)**

Existence of solutions of differential equations, direction field plots. One-step methods: Euler's method, second-order methods, Runge-Kutta schemes; multi-step methods: predictor-corrector methods, stability, automatic error control, results of Dahlquist, Butcher, Stetter, and Gragg. Higher-order equations and systems of equations. Introduction to boundary-value problems. *Prep. 10.8M5.*

**10.8N1 Celestial Mechanics I (2 q.h.)**

Elliptic motion, equations of motion, equations for oscillating orbital elements. *Prep. 10.8B6 and Mechanics.*

**10.8N2 Celestial Mechanics II (2 q.h.)**

Mean orbits, integration of orbits, partial derivatives of position and velocity. *Prep. 10.8N1.*

**10.8N3 Celestial Mechanics III (2 q.h.)**

Motion of the earth about its center of mass, observational data, iterative method of least squares. *Prep. 10.8N2.*

**10.8P1, 10.8P2, 10.8P3 Algebra I, II, III (2 q.h.)**

The content of these courses is the same as 10.9A2 and the first part of 10.9A4. *Prep. 10.8B2 or equivalent.*

**10.8T1 Matrix Analysis I (2 q.h.)**

Solutions of systems of linear equations by direct and iterative methods; matrix inversion, characteristic values, canonical forms. *Prep. 10.8B6 or equivalent.*

**10.8T2 Matrix Analysis II (2 q.h.)**

Discussion of Hermitian, orthogonal, and unitary matrices and their physical significance. Functions of matrices and matrix calculus. *Prep. 10.8T1.*

**10.8T3 Tensor Analysis I (2 q.h.)**

Tensor algebra; review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and  $n$ -dimensional affine space. The coordinate tensor, tensor products, invariants, physical components. *Prep. 10.8B6 or equivalent.*

**10.8T4 Tensor Analysis II (2 q.h.)**

Symmetric and alternating tensors, rank and support, duality. The metric tensor. Tensor Calculus: curvilinear coordinates, tangent spaces. *Prep. 10.8T3.*

**10.8T5 Tensor Analysis III (2 q.h.)**

Tensor fields, covariant derivative. Riemannian geometry, geodesics, curvature tensor. Parallel displacement, linear connections, exterior forms. *Prep. 10.8T4.*

**10.9A1 Basic Analysis and Topology (4 q.h.)**

Sets and functions. Metric spaces with examples. Continuous functions. Notions of compact, complete, paracompact spaces. Function spaces, especially Banach and Hilbert spaces. Multilinear maps. Coordinate-free calculus, inverse and implicit function theorems, Taylor formula, first-order differential equations.

**10.9A2 Algebra A (4 q.h.)**

Theory of groups: Examples of groups. Subgroups and homomorphisms. Permutation groups, actions, orbits, stabilizer groups, index formulas, quotient spaces, conjugacy, geometric examples. Simplicity of the alternating group. Free groups and groups defined by generators and relations. Sylow theorems and the systematic study of groups of small order. Structure of finitely generated abelian groups. A brief study of the classical linear groups.

**10.9A3 Integration (3 q.h.)**

Measure spaces. Abstract Lebesgue integral. Convergence theorems. Construction of Lebesgue measure on  $\mathbb{R}^n$ . Radon-Nikodym theorem. Product measure theorem. Fubini's theorem.

**10.9A4 Algebra B (3 q.h.)**

Polynomial functions and formal polynomials. Polynomial rings and unique factorization. Construction of extension fields. Splitting fields of polynomials. Theory of fields and Galois theory. Examples.

**10.9A5 General Topology (3 q.h.)**

General topological spaces. Moore-Smith convergence. Compactness and connectedness. Separation properties. Products. Quotient spaces. Inductive and projective limits. Function spaces. Elementary homotopy. Some of the functorial viewpoint.

**10.9A6 Complex Variables (4 q.h.)**

Elementary properties of holomorphic functions, harmonic functions, maximum modulus principle, approximation theorems, conformal maps, zeroes of holomorphic functions, analytic continuation.

**10.9A7 Geometry (4 q.h.)**

Fundamental group, covering spaces, simplicial complexes, manifolds, orientation, linear group manifolds. Some attempt to tie up algebra and topology.

**10.9B3 Constructive Algebra (4 q.h.)**

A constructive development of some of the old familiar areas of algebra: principal ideal domains, Dedekind domains, factorial domains, Noetherian rings.

**10.9B9 Seminar: Constructive Analysis (4 q.h.)**

Topics in classical mathematics and analysis of them from the constructive standpoint.

**10.9C1, 10.9C2 Functional Analysis A, B (4 q.h.)**

Topological vector spaces, Banach spaces, Hilbert spaces, algebras of operators, representations.

**10.9E1 Advanced Differential Equations (4 q.h.)**

The material of 10.8E1 and 10.8E2 is covered as a unit in 10.9E1. *Prep. 10.9A1.*

**10.9E3, 10.9E4 Partial Differential Equations A, B (4 q.h.)**

Treats a selection of the material of 10.8E4, 10.8E5, and 10.8E6. *Prep. 10.9A1 and 10.9A6.*

**10.9E6 Integral Equations (4 q.h.)**

Covers material from 10.8E8, 10.8E9. *Prep. 10.9A1.*

**10.9G1 Probability (4 q.h.)**

Probability spaces. Probability laws of families of random variables. Distribution functions and characteristics functions on  $\mathbb{R}^n$ . Strong limit laws of sums of independent random variables. Central limit theorem. Conditional expectations.

**10.9H1 Mathematical Statistics (4 q.h.)**

This course embodies the material in 10.8G4 and 10.8G5. *Prep. 10.8G1 or equivalent.*

**10.9M5, 10.9M6 Lie Groups and Fourier Theory A, B (4 q.h.)**

Certain questions in analysis take on a special simplicity due to the benevolent presence of an algebraic structure. Starting with simple classical examples, the course will work toward a deeper and more contemporary vision of Lie groups and Fourier theory. Ideas will outweigh proofs.

**10.9N1 Advanced Mathematics A (4 q.h.)**

Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra. *Prep. Differential Equations. Not to be used for credit toward the program in mathematics.*

**10.9N2 Advanced Mathematics B (4 q.h.)**

This course embodies the material in 10.8A3 and 10.8A4. *Prep. 10.9N1. Not to be used for credit toward the program in mathematics.*

**10.9P0 Seminar: Classical Groups (up to 4 q.h.)**

Topics in classical groups as chosen by participants.

**10.9P1 Representations of Groups (4 q.h.)**

A basic course in group representations and character theory.

**10.9Q1 Homological Algebra (4 q.h.)**

Maps, sums, tensor products, exact sequences, homology, derived functors and adjoints, applications to algebra and topology.

**10.9Q2 Module Theory (4 q.h.)**

Techniques of commutative and homological algebra applied to modules and ideals. Applications to regular and Gorenstein rings.

**10.9Q6 Ring Theory (4 q.h.)**

A survey of ring theory: Commutative algebra and how to interpret an algebraic statement geometrically. Semi-simple rings and modules with structure and splitting theory and Brauer group. The analogous splitting theory for field extensions.

**10.9T1 Matrix Analysis (4 q.h.)**

This course embodies the material in 10.8T1 and 10.8T2. *Prep. 10.8B6 or equivalent.*

**10.9U1, 10.9U2 Algebraic Topology A, B (4 q.h.)**

Topics from: Homology groups, homology sequences, fiber spaces, sheaves, products in homology and cohomology, cohomology algebra, Kunneth theorems, Steenrod operations, Poincare duality, higher homotopy groups and the Hurewicz theorem, characteristic classes.

**10.9W1, 10.9W2 Dynamical Systems A, B (4 q.h.)**

Structural stability and qualitative theory of dynamical systems.

**10.9W9 Seminar: Dynamical Systems (up to 4 q.h.)**

Topics in dynamical systems as chosen by participants.

**10.9Z1 Master's Thesis (up to 6 q.h.)****10.9Z2 Readings in Analysis (4 q.h.)****10.9Z3 Readings in Algebra (4 q.h.)****10.9Z4 Readings in Topology (4 q.h.)****10.9Z5 Doctoral Dissertation**

# physics

## Professors

Michael J. Glaubman, Ph.D.,  
Chairman  
Petros N. Argyres, Ph.D.  
Richard L. Arnowitt, Ph.D.  
Alan H. Cromer, Ph.D.  
Marvin H. Friedman, Ph.D.  
Marvin W. Gettner, Ph.D.  
Walter Hauser, Ph.D.  
Bertram J. Malenka, Ph.D.  
Carl J. Shiffman, Ph.D.  
Roy Weinstein, Ph.D.

## Associate Professors

Ronald Aaron, Ph.D.  
Lowell Dworin, Ph.D.  
David A. Garelick, Ph.D.  
Hyman Goldberg, Ph.D.  
Bernard A. Gottschalk, Ph.D.  
Pran Nath, Ph.D.  
James E. Neighbor, Ph.D.  
Clive H. Perry, Ph.D.  
John F. Reading, Ph.D.  
Eugene J. Saletan, Ph.D.  
Yogendra N. Srivastava, Ph.D.  
Michael T. Vaughn, Ph.D.  
Eberhard von Goeler, Ph.D.  
Fa Yueh Wu, Ph.D.

## Admission

In addition to the admission requirements listed on page 23, applicants must have had a program which includes 12 semester hours of physics beyond general physics, and mathematics through differential equations.

## THE MASTER'S DEGREE

### Program

Forty-two quarter hours of academic credit are required. The registration of full-time students will be approved by a faculty adviser. Because of the general increase in the level of undergraduate and graduate

## Assistant Professors

Evangelos M. Anastassakis, Ph.D.  
Robert I. Boughton, Ph.D.  
David R. Bowen, Ph.D.  
Gerard J. Dreiss, Ph.D.  
William L. Faissler, Ph.D.  
James M. Loveluck, Ph.D.  
Robert P. Lowndes, Ph.D.  
Gerhard Lutz, Ph.D.  
James L. Sigel, Ph.D.  
Jeffrey B. Sokoloff, Ph.D.  
Allan Widom, Ph.D.

## Instructor

Merlin G. Miller, M.S.

## Research Associates

Nathaniel M. Alpert, Ph.D.  
David Earles, Ph.D.  
William L. Hogan, M.S.  
Michael J. Russo, Ph.D.  
Edward I. Shibata, Ph.D.  
Giulia Srivastava, Ph.D.

## Lecturers

Harry Gelman, Ph.D.  
William S. Hellman, Ph.D.  
John R. Jasperse, Ph.D.  
Paul Rothwell, Ph.D.

courses in recent years, it is recommended that students who are weak in mechanics, electricity and magnetism, or modern physics take one or more of the following sequences.

- 11.200, 11.201 Mechanics I, II
- 11.208 Mathematical Physics
- 11.210, 11.211 Electricity and Magnetism I, II
- 11.230 Modern Physics
- 11.240, 11.241 Quantum I, II

These courses carry credit toward the master's degree at the rate of three quarter hours of graduate credit for a four quarter-hour undergraduate course. A maximum of nine quarter hours of graduate credit may be earned in undergraduate courses. Course descriptions will be found in the catalogue of the College of Liberal Arts.

A thesis option is available for a full-time student with the approval of the department. If approved, a thesis carries six quarter hours of credit.

The program may be completed on a part-time basis, and the student may progress according to his ability and time available.

All students will be required to complete the required courses listed below.

	<b>Total Credits</b>
Mathematical Physics	
11.811, 11.812, 11.813; or 11.814, 11.815 .....	6
Classical Mechanics	
11.821, 11.822, 11.823; or 11.824, 11.826 .....	6
Electromagnetic Theory	
11.831, 11.832, 11.833; or 11.834, 11.835 .....	6
Quantum Theory	
11.841, 11.842, 11.843 .....	12
	<hr/> 30

In addition to these 30 quarter hours of required courses, 12 more quarter hours must be taken. These may be elected from any course in physics, mathematics, engineering, chemistry, or biology, for which the student has the necessary preparation.

## THE DOCTOR OF PHILOSOPHY DEGREE

### Admission

A student's eligibility to take the Ph.D. qualifying examination is decided by a committee of the department on the basis of the student's overall performance. Full-time students will be notified of their status sometime in their second year of study. Students enrolled in the part-time master's degree program who wish to qualify for Ph.D. candidacy may so indicate by petition to the graduate committee of the department. The petition should include a timetable for the taking of the quali-

fying examination and a course plan for completing 60 quarter hours of graduate study.

### **Residence Requirement**

After a student has completed 42 quarter hours of course work and has passed his qualifying examination, he becomes a doctoral degree candidate and must satisfy the residence requirement by one year of full-time graduate work.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations.

### **Qualifying Examination**

The qualifying examination consists of a written and an oral part. The written examination covers the fields of classical mechanics, quantum mechanics, and electromagnetic theory and students select questions from the field of thermodynamics, statistical mechanics, plasma physics, nuclear physics, elementary particles, solid state, and special relativity. This examination is given twice a year, once in September and once in February. A student must take this examination during the next fall quarter following the quarter in which he became eligible to take it. If the examination is failed, it may be repeated the next time it is given.

### **Course Requirements**

The course requirements, in addition to the 30 quarter hours of required courses for the masters' degree, are:

	Credits
11.836 Electromagnetic Theory C . . . . .	3
11.844 Quantum Theory D . . . . .	24
Physics Electives . . . . .	24
	30

The electives must be chosen so as to satisfy the distribution requirements specified by the department.

### **Dissertation**

The student should have made arrangements for a dissertation adviser by the time he wishes to take the oral part of the qualifying examination. An outline of the dissertation must be approved by the departmental graduate committee at least eight months before the dissertation examination.

### **Teaching Requirement**

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.



## Final Oral Examination

This examination will be held in accordance with the graduate school regulations.

## DESCRIPTION OF COURSES

### 11.801, 11.802, 11.803 Introductory Modern Physics I, II, III (2 q.h.)

*The courses in Introductory Modern Physics carry graduate credit, but may not be used in satisfying requirements for the master's degree in physics.*

A study of the breakdowns of the classical laws of physics, review of important twentieth-century experiments showing the quantum aspects of radiation and matter, introduction to special relativity, the discovery of the electron, the nuclear atom, the radiation paradox, the Bohr theory of hydrogen and the inner shells of heavy atoms, wave aspects of matter, and Schrodinger's wave mechanics.

### 11.810 Experimental Techniques

An introduction to techniques required for experimental research. *Prep. Consent of instructor.*

### 11.811, 11.812, 11.813 Mathematical Physics I, II, III (2 q.h.)

An introduction to mathematical methods of theoretical physics. Topics to be covered include vector spaces, eigenfunction expansions, special functions of mathematical physics, theory of functions of a complex variable, differential and integral equations, generalized functions, Green's functions, partial differential equations, perturbation theory, and selected applications.

### 11.814 Mathematical Physics A (4 q.h.)

### 11.815 Mathematical Physics B (3 q.h.)

These two courses cover essentially the same material as 11.811, 11.812, 11.813. *Prep. 11.814.*

### 11.821, 11.822, 11.823 Classical Mechanics I, II, III (2 q.h.)

Newton's laws of motion, constraints and D'Alembert's principles, Lagrange's equations, Hamilton's variational principle, central force motion, Hamilton's canonical equations, coupled oscillations, rigid body motion, Hamiltonian formulation of mechanics, canonical transformations, Hamilton-Jacobi theory, action-angle variables, classical perturbation theory.

### 11.824, 11.826 Classical Mechanics A, B (3 q.h.)

The content of these two courses is essentially the same as 11.821, 11.822, 11.823.

### 11.827, 11.828, 11.829 Statistical Mechanics A, B, C (3 q.h.)

A study of the basics of thermodynamics, density matrix and partition function for the canonical and grand canonical ensembles and their connection with thermodynamic functions, application to specific examples, fluctuations, and irreversible processes. *Prep. 11.843 (may be taken concurrently).*

**11.831, 11.832, 11.833 Electromagnetic Theory I, II, III (2 q.h.)**

Electrostatics, boundary value problems, Green's functions and orthogonal function expansion, electrostatics of dielectric media, magnetostatics, time varying fields, Maxwell's equations, energy and momentum of the electromagnetic field, boundary conditions, plane waves, Fourier analysis, radiation of electromagnetic waves.

**11.834, 11.835 Electromagnetic Theory A, B (3 q.h.)**

The content of these two courses is the same as 11.831, 11.832, 11.833.

**11.836 Electromagnetic Theory C (3 q.h.)**

Irreducible multipole expansion of the electromagnetic field; introduction to special relativity, radiation from high-speed particles. *Prep. 11.835.*

**11.837 Electromagnetic Theory D (3 q.h.)**

Advanced topics in electromagnetic theory such as problems involving radiation reaction, energy, momentum, and the equations of motion of a high-speed particle, Cerenkov radiation, the Lagrangian and Hamiltonian formulation of electromagnetism. *Prep. 11.836.* Offered biennially. Fall qtr. 1972

**11.838, 11.839 General Relativity A, B (3 q.h.)**

A brief survey of differential geometry, physical basis of the Einstein equations, simple solutions and experimental tests, cosmology, asymptotic properties of the Einstein equations (radiation, energy, momentum), quantization of the theory. *Prep. 11.837; and 11.823 or 11.826.* Offered biennially.

Winter qtr. 1972, spring qtr. 1973

**11.841 Quantum Theory A (4 q.h.)**

Experimental basis of quantum theory, Schroedinger equations, and probability interpretation. Uncertainty principle, one-dimensional problems, operator methods for harmonic oscillator, orbital angular momentum, central force problem. *Prep. 11.821 or 11.824; and 11.813 or 11.815.* Fall and winter qtrs.

**11.842 Quantum Theory B (4 q.h.)**

Scattering problems. Born approximation, phase shift analysis, introduction to S-matrix theory, general vector space formulation of quantum mechanics. *Prep. 11.841; and 11.823 or 11.826 (may be taken concurrently).* Winter and spring qtrs.

**11.843 Quantum Theory C (4 q.h.)**

Time-independent perturbation theory (nondegenerate and degenerate), time-dependent perturbation theory, semiclassical theory of radiation, Pauli wave equation. *Prep. 11.842.* Fall and spring qtrs.

**11.844, 11.845 Quantum Theory D, E (3 q.h.)**

A study of the special topics in nonrelativistic and relativistic quantum mechanics, Dirac wave equations, addition of angular momentum problems. *Prep. 11.843.*

**11.851 Plasma Physics I (2 q.h.)**

Motion of charged particles in electromagnetic fields, propagation of electromagnetic waves in ionized gases, elementary theory of plasma, Boltzmann equation for plasma, fundamentals of magnetohydrodynamics. *Prep. 11.832.* Offered biennially. Fall qtr. 1971

**11.852 Plasma Physics II (2 q.h.)**

Application of MHD to plasma confinement, motions of plasma across and along magnetic lines of force, plasma oscillations, waves in magnetoplasma, dispersion relations, nonlinearities in plasma. *Prep. 11.851. Offered biennially.*

Winter qtr. 1971

**11.853 Plasma Physics III (2 q.h.)**

Fokker-Planck equations for plasma, plasma conductivity, run-away electrons, relaxation times, radiation from plasma, stability theories, relativistic plasma. *Prep. 11.852. Offered biennially.*

Spring qtr. 1972

**11.861 Introductory Nuclear Physics I (2 q.h.)**

Basic description of nuclei, radioactivity, nuclear detectors. *Prep. A one-year course in atomic and nuclear physics.*

**11.862 Introductory Nuclear Physics II (2 q.h.)**

Static properties of nuclei, nuclear models, nuclear transitions. *Prep. 11.861.*

**11.863 Introductory Nuclear Physics III (2 q.h.)**

Theoretical interpretation of the experimental data concerning the nucleon-nucleon interaction. Topics such as the variety of nucleon-nucleon scattering experiments, phase shift analysis, potential and other phenomenological models, and meson theory will be discussed. *Prep. 11.843 (may be taken concurrently).* Offered biennially.

Fall qtr. 1971

**11.864 Theoretical Nuclear Physics A (3 q.h.)**

Nuclear reactions, high-energy physics, elementary particles. *Prep. 11.862.*

**11.865 Theoretical Nuclear Physics B (3 q.h.)**

Nuclear models. The shell model, the collective model and the optical model will be considered. *Prep. 11.864. Offered biennially.*

Winter qtr. 1971

**11.866 Theoretical Nuclear Physics C (3 q.h.)**

Special topics which may vary from year to year, such as beta-decay, nuclear reactions, electromagnetic interactions with nuclei and high energy scattering phenomena. *Prep. 11.865. Offered biennially.*

Spring qtr. 1972

**11.871 Introductory Solid-State Physics I (2 q.h.)**

An introduction to the electrical and magnetic properties of matter. *Prep. A one-year course in atomic and nuclear physics.*

**11.872 Introductory Solid-State Physics II (2 q.h.)**

A continuation of the discussion of the electrical and magnetic properties plus the optical properties of matter. *Prep. 11.871.*

**11.873 Introductory Solid-State Physics III (2 q.h.)**

The thermal properties of matter. *Prep. 11.872.*

**11.874, 11.875, 11.876 The Physics of Solids A, B, C (3 q.h.)**

Crystal structure and macroscopic properties of solids; lattice dynamics; band theory of solids; transport theory and the Boltzmann equation; the Fermi surface; magnetism; dielectric properties. *Prep. 11.842 and 11.827 (may be taken concurrently).*

**11.877, 11.878, 11.879 Advanced Theory of Solids A, B, C (3 q.h.)**

Adiabatic approximation and theory of lattice vibrations of perfect crystals; optical phonons and polaritons; phonons in imperfect crystals; neutron scatter-

ing; photon absorption and scattering; recoilless emission; phonon-phonon interaction; second sound. One-electron approximation and theory of Bloch electrons; Bloch electrons in external fields. Screening and plasmons; excitons; electron-phonon interaction; polarons; quantum theory of transport; electronic and lattice conduction; ultrasonic attenuation. Ferromagnetism and antiferromagnetism; magnons; magnetic resonance; alloys, amorphous semiconductors; liquid solutions. *Prep. 11.828 and 11.876. Offered biennially.* 1972-1973

**11.880 Introductory Particle Physics (3 q.h.)**

Introduction to principles and techniques of elementary particle physics. Discussion includes scattering phenomena; baryon, meson, lepton phenomenology; strange particles; symmetry properties; experimental techniques. *Prep. Consent of instructor.*

**11.881 Quantum Theory of Fields A (3 q.h.)**

For description see 11.883.

*Prep. 11.836 and 11.844 (may be taken concurrently).*

**11.882 Quantum Theory of Fields B (3 q.h.)**

For description see 11.883.

*Prep. 11.881 and 11.845 (may be taken concurrently).*

**11.883 Quantum Theory of Fields C (3 q.h.)**

*Prep. 11.882.*

The content of the above three courses provides a study of the quantum mechanical, one-particle wave equations for electrons, nucleons, neutrinos, and mesons, symmetric and antisymmetric multiparticle systems, second quantization, free relativistic boson fields, fermion fields and electromagnetic fields, relation to the description of various elementary particles, theory of interacting fields and particles, formal scattering theory, Feynman diagrams, renormalization procedures, application to scattering, production and decay phenomena, quantum electrodynamics effects, recent formal developments.

**11.884, 11.885, 11.886 Particle Physics A, B, C (3 q.h.)**

A discussion of the properties of baryons, mesons, leptons, and resonant states. The general phenomenological framework of the fundamental interaction between elementary particles. The implication of relativistic covariance, unitarity, analyticity, invariance, and conservation laws. *Some knowledge of elementary quantum field theory is desirable but not required.* *Prep. 11.844 (may be taken concurrently).* Offered biennially.

**11.887, 11.888, 11.889 Many-Body Problems A, B, C (3 q.h.)**

An introduction to some many-body problems and the mathematical techniques used in dealing with them. The following topics are discussed: Theory of linear response and correlation functions. Hartree-Fock and random phase approximations. Many-body perturbation theory. Landau-Fermi liquid theory. Applications to solid-state problems. Superconductivity. Superfluidity. Introduction to the method of Green's functions. *Prep. 11.843 and 11.827 (may be taken concurrently).* Offered biennially. 1971-1972

**11.990 Special Topics in Physics (maximum: 4 q.h.)**

A discussion of special topics in physics to be chosen by the instructor. *Prep. Consent of the instructor.*

**11.991 Master's Thesis** (6 q.h.)

Experimental and theoretical work for master's degree.

**11.992 Special Problems in Physics** (maximum: 4 q.h.)

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of faculty member.*

**11.995 Doctoral Dissertation**

Experimental and theoretical work for Ph.D. candidates.

# political science

## Professors

R. Gregg Wilfong, Ph.D.,  
Chairman  
David W. Barkley, M.P.A., Ph.D.

## Associate Professors

L. Gerald Bursey, Ph.D.  
Robert L. Cord, Ph.D.  
Minton F. Goldman, Ph.D.  
Steve Worth, Ph.D.

## Assistant Professors

George E. Berkley, Ph.D.  
Walter S. Jones, M.A.L.D.  
James A. Medeiros, Ph.D.  
David G. Pfeiffer, Ph.D.

## Lecturers

Joseph F. Courtney, M.P.A., J.D.  
Robert E. Curtis, M.G.A.  
Robert H. McClain, Jr., M.P.A.  
Nicholas Nyary, Ph.D.

## Admission

In addition to the admission requirements listed on page 23, applicants for the Master of Arts program should have had a background which includes at least 15 semester hours of political science or government. All applicants must take the Graduate Record Examination.

Applicants for the Master of Public Administration program should demonstrate a clear and strong interest in public administration. All applicants for admission must furnish a statement that supports his or her interest in public administration and provides reasons for wishing to enter this program. Although it is anticipated that most candidates for this program will come with a major concentration in the social sciences, this is not mandatory, and applicants from other fields such as engineering, law, the sciences, and business administration will be considered for candidacy.

## THE MASTER OF ARTS DEGREE

### Program

Forty-two quarter hours of academic work are required. With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of eight quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries six quarter hours of credit.

### **Comprehensive Examination**

This examination will be held in accordance with the general graduate school regulations. Every candidate for the degree must pass examinations in two fields as prescribed by the department. Choice may be made from the following fields: American Government, Comparative Government, International Relations, Political Theory, or Public Administration.

## **THE MASTER OF PUBLIC ADMINISTRATION DEGREE**

### **Program**

Forty-two hours of academic work are required. All students must complete the following seven courses:

22.872	Public Fiscal Management
22.874	Functions and Techniques of Public Management
22.878	Research Methods in Public Administration
22.880	Survey of Public Administration
22.882	Public Personnel Administration
22.888	Administrative Law
22.890	Research Seminar in Public Administration

At least three additional courses must be selected from courses designated public administration electives. Not more than four courses can be selected from other graduate courses offered by the University, and these must have the approval of the faculty adviser.

### **Comprehensive Examination**

A candidate for the degree must pass a general examination in the field as a whole which will test his or her ability to deal analytically with concepts in public administration and to have such mastery of the literature that useful reference may be made to it in dealing with administrative problems.

## **DESCRIPTION OF COURSES**

*All courses carry three quarter hours of credit unless otherwise specified.*

*All courses are seminars.*

### **22.800 American Government**

Analysis in depth of selected problems in American government. Examples of problems are: transition of American political parties, legislative reapportionments, and the decline of Congress as a law-making body. *M.P.A. elective.*

**22.820 Legislative Process**

Study of Congress and of the influence of the President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy. Comparisons will be made with legislative process in the states. *M.P.A. elective.*

**22.824 The Presidency**

Examination of the place and function of the chief executive in the formulation and execution of public policy. *M.P.A. elective.*

**22.826 American Electoral Behavior**

The theoretical and methodological assumptions of election studies of the American political system will be analyzed and the substantive conclusions carefully reviewed.

**22.828 The Judiciary**

Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law where the Court's decisions have a profound impact on the basic structure of American politics (apportionment, economic regulation, federalism, etc.).

**22.830 Civil Rights**

Examination of the doctrine of constitutionalism illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of Federal courts, and Congressional enactments.

**22.832 Intergovernmental Relations**

An institutional-behavioral analysis of the changing relationship between the various levels of American government — national, state, and local — relating the pattern of change to the social and economic forces which underlie it. *M.P.A. elective.*

**22.834 Constitutional Law**

A case development in the basic structural aspects of the American constitutional system including an evaluation of federalism, separation of powers, and the formal and informal processes of amendment and constitutional change.

**22.836 Federal Bureaucracy**

Examination of dynamic and structural aspects of the national government, with attention to the place of the national administration in the federal system. *M.P.A. elective.*

**22.840 Problems in State Government**

Appraisal of the problems of contemporary state government in the U.S. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed. *M.P.A. elective.*

**22.844 Urban Government**

The contemporary crisis in urban government—problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed. *M.P.A. elective.*



**22.845 Problems of Municipal Administration**

Selected case problems and topics in municipal administration including organization, financial management, personnel and labor relations, municipal services, and public and political relations. Individual research is stressed. *M.P.A. elective.*

**22.846 Problems of Regional and Urban Development**

An examination of the role of government and politics in the planning, programming, and administration of regional and urban development in the United States. Consideration is given to urban renewal; interurban and interregional competition; interstate compacts; public authorities; T.V.A., Appalachia, and New England regional development; anti-poverty programs; and conflicts between public and private interests. Individual research is stressed. *M.P.A. elective.*

**22.848 Problems of Urban Renewal**

Examination of the role of government, politics, and public policy in the urban renewal process and related problems of housing in the United States. *M.P.A. elective.*

**22.850 Comparative Politics I**

Comparative analysis of politics and political systems with special attention to fundamental problems of theory and practice. The chief focus is on contemporary political systems and contemporary theories in the field of comparative politics. Traditional models are also treated, but more briefly. Particular attention will be paid to British and American political experience.

**22.851 Comparative Politics II**

Extends and intensifies the comparative analysis of politics undertaken in Comparative Politics I by examining a broader range of institutional experience. Special attention will be given to European political experience, particularly that of France and Germany. *Prep. 22.850.*

**22.854 Totalitarianism**

An analysis of totalitarianism and dictatorship including study of historical background; fundamental characteristics; theories of origin, nature, and significance; and evaluation of techniques, ideologies, policies, and instruments of power. Special attention will be given to the government and politics of the Soviet Union.

**22.856 Government and Politics of France**

A study of governmental organization and political behavior in France today. Special attention is given to the role of the presidency, executive-legislative relations, and the political party system.

**22.872 Public Fiscal Management**

A study of the interrelationships in public administration between systems of finance and the achievement of program objectives. Emphasis is placed upon those aspects of the budgetary process that bear on fiscal policy and appropriations.

**22.874 Functions and Techniques of Public Management**

An introduction to problems in public management and techniques for dealing with them. This will include functions of middle management, supervision, administration of staff activities (e.g. planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management.

**22.876 Administrative Behavior**

An analysis of the sociological and psychological aspects of organization and management. Topics include: bureaucratic leadership; interaction of individual and organization; dynamics of the small group; pathology of bureaucratic behavior. *M.P.A. elective.*

**22.878 Research Methods in Public Administration**

Examination and application of the qualitative and quantitative methods of research in public administration.

**22.880 Survey of Public Administration**

Introduction to the literature and the major topics in public administration with special attention given to the interrelationships of politics and administration.

**22.882 Public Personnel Administration**

Technique, practice, and organization of personnel functions in public administration, including recruitment, compensation, training, discipline, and relations with employee organizations.

**22.883 Comparative Public Administration**

A comparative study of the approaches to public administration in selected democratic governments in the United States and Europe. *M.P.A. elective.*

**22.884 Comparative Metropolitan Government and Politics**

An examination of structure, administration, and politics of selected major European cities in the context of the metropolitan problem in the United States with special emphasis on problem solution and comparative administration. *M.P.A. elective.*

**22.888 Administrative Law**

Study of rule-making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques.

**22.890 Research Seminar in Public Administration**

Will require each student to develop and report upon an individual research project in public administration. This seminar will normally be taken in the last quarter of study for the M.P.A. degree.

**22.900 Ancient and Medieval Political Thought**

The development of political thought from Greek antiquity to the end of the Middle Ages. Both historical and analytical approaches will be utilized. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

**22.910 Modern Political Thought**

Examination of political thought from Machiavelli to Marx.

**22.920 Contemporary Political Theory**

The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory, philosophy, and political science.

**22.922 The Measurement of Political Events**

The purpose of this course is to acquaint political science majors with some analytical and mathematical tools appropriate for use in studying politics.

**22.924 Strategy in Politics**

An examination of formal theories of political behavior, stressing elements of strategy and their implications. Relationships between political actors, patterns in political processes, bargaining, decision making, and voting will be covered.

**22.926 Trends in American Political Thought**

Examination of intellectual concepts and movements that have informed and influenced American political life with emphasis upon those relating to the making and execution of public policy. *M.P.A. elective.*

**22.928 Organization Theory**

An in-depth study of the major organization theories including the scientific basis for organization theory; models and ideal types; decision-making; application of game theory; systems analysis. *M.P.A. elective.*

**22.942 Asia and the Politics of Development**

This course is an investigation of the character of political development in general and of the problems it poses for Asian political systems in particular. The focus will be on China, Vietnam, and Thailand.

**22.944 Nationalism**

The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

**22.946 The Politics of Revolution and Change**

Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

**22.948 Government and Politics of North Africa and the Middle East**

Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East.

**22.950 United States-Soviet Relations**

The relations between the United States and the Soviet Union from 1917 to the present. Topics stressed are: the "nonrecognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict.

**22.951 United States-Far Eastern Relations**

American diplomacy in the Far East, with primary concentration on Japan since World War II, the two Chinas, and Southeast Asia.

**22.952 Communist China's Foreign Policy**

A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision making in both the party and state apparatus.

**22.954 Soviet Relations with Eastern Europe**

An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop communism and maintain a position of pre-eminence in this region.

**22.956 Government and Politics in Sub-Saharan Africa**

Comparative analysis of the political systems and foreign policies of selected African states south of the Sahara. Special attention is given to the Republic of South Africa and its policy of apartheid.

**22.958 The Formulation and Conduct of American Foreign Policy**

The governmental mechanism for foreign policy formulation and its conduct. Problems in decision making and execution are emphasized.

**22.959 American Foreign Policy**

Examination in depth of selected issues concerning the role of the United States in world affairs since 1945.

**22.960 Problems of World Order I**

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

**22.961 Problems of World Order II**

Continuation of 22.960: political problems of world order are stressed. Representative topics considered are arms control, disarmament, strengthening the United Nations, and evaluation of world government proposals. *Prep.* 22.960.

**22.964 The United Nations**

Selected topics on the "non-political" work of the United Nations: human rights; economic, social, health and related problems; decolonization and the trusteeship system.

**22.966 International Law**

Examination of selected topics in International Law not covered in 22.960 and 22.961.

**22.967 Regional Organization**

A study of international organization at the regional level, concerned with examining the capability of institutions to foster integration of policy and authority, and with the effect of this progress upon broader international cooperation.

**22.968 The Atlantic Community**

A topical analysis of European-American diplomacy from the Marshall Plan to the present, with attention to security matters, United States policy regarding the European integration movement, the Anglo-American "special relationship," the Franco-American discord, and the German dilemma. Continuing focus will be upon Europe as part of the global diplomacy of a superpower as world politics assumes a multipolar configuration.

**22.969 The United States and the United Nations**

A study of the pursuit of American foreign policy through the United Nations, with emphasis on the uses and effects of parliamentary diplomacy.

**22.990 Assigned Reading (maximum: 6 q.h.)**

Assigned reading under supervision of a faculty member.

**22.991 Thesis (6 q.h.)**

Thesis supervision by individual members of the department.

# psychology

## **Professors**

A. Bertrand Warren, Ph.D.,  
Chairman  
John C. Armington, Ph.D.  
Bertram Scharf, Ph.D.  
Harold S. Zamansky, Ph.D.

## **Associate Professors**

Edward A. Arees, Ph.D.  
Roger F. Brightbill, Ph.D.  
Lane K. Conn, Ph.D.  
Charles Karis, Ph.D.  
Richard I. Lanyon, Ph.D.  
Helen S. Mahut, Ph.D.

## **Assistant Professors**

Thomas Corwin, M.A.  
Amy M. L. Schick, Ph.D.  
Dale R. Schissler, Ph.D.  
Michael Terman, Ph.D.

## **Lecturer**

Herbert Meiselman, Ph.D.

## **Admission**

In addition to the admission requirements listed on page 23, applicants are expected to have had at least 15 semester hours of psychology, including experimental psychology and statistics. This requirement may be waived in some cases. The Miller Analogies Test is desirable but not required. All applicants must take the Graduate Record Examination. Three letters of recommendation are required.

## **THE MASTER'S DEGREE**

The master's degree is usually taken en route to the Ph.D. Requirements for this degree are 42 quarter hours of academic work including research for six quarter hours of credit, and the passing of a written qualifying examination. The academic work, planned as an integral part of the doctoral program, is outlined on the following pages.

## **THE DOCTOR OF PHILOSOPHY DEGREE**

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work after admission to doctoral candidacy.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations.

**Qualifying Examination**

Students usually take a qualifying examination at the end of the first year, but must take it no later than two years after admission to the graduate program. The exam is generally given in June and covers major areas of study. The examination in any area may be repeated with the approval of the departmental graduate committee.

**Comprehensive Examination**

During the period of doctoral degree candidacy, each student must pass a comprehensive examination in the area of his specialty.

**Course Requirements**

A minimum of 27 quarter hours of academic work beyond those required for the master's degree is required. The nature and number of courses must be approved by the adviser and the departmental graduate committee. Approved courses may be taken in other departments.

**Dissertation Requirement**

A student may start his dissertation during his first year of doctoral work. A dissertation committee will be appointed by the chairman of the department upon the recommendation of the departmental graduate committee. The dissertation committee will be responsible for initial approval of the dissertation in its final form.

**Language Requirement**

A reading knowledge of one foreign language is required. Normally the language selected will be French, German, or Russian. Other languages may be selected by petition to the departmental graduate committee. Proficiency in a language will be determined in a manner prescribed by the departmental graduate committee. The student must take the language examination during his first two years of study.

**Teaching Requirement**

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

**Final Oral Examination**

The final oral examination is taken after completion of all other requirements for the degree. This examination will not be held until at least two weeks after the dissertation has been accepted by the

departmental graduate committee and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will deal with the subject matter of the doctoral dissertation, significant developments in the field of the dissertation, and subject matter as required by the examining committee.

### Program

The program will normally be taken in accordance with the following pattern:

FIRST YEAR					
Fall		Credits	Winter		Credits
19.808	Quantitative Methods I . . . . .	3	19.809	Quantitative Methods II . . . . .	3
19.817	General Experimental Psychology I . . .	4	19.818	General Experimental Psychology II . . .	4
19.886	Departmental Research Seminar I	2	19.887	Departmental Research Seminar II	2
		<u>9</u>			<u>9</u>
Spring			Credits		
19.810	Quantitative Methods III . . . . .	3			
19.819	General Experimental Psychology III . .	4			
19.888	Departmental Research Seminar III	2			
		<u>9</u>			

### SECOND YEAR

Six quarter hours of research and 9 quarter hours of electives must be taken during the second year.

All course work beyond the first year is elective and is determined by the student and his adviser with the approval of the graduate committee.

### DESCRIPTION OF COURSES

*All courses carry three quarter hours of credit unless otherwise specified.*

#### 19.801 Statistics I (2 q.h.)

A thorough review of basic descriptive and predictive statistics, emphasizing the choice of appropriate statistical models for various scales of measurement. *Students may be exempted from this course by passing an examination which is administered during the first week of classes. This course gives no credit toward a degree in psychology.*



**19.802, 19.803 Statistics II, III**

Probability, correlation, analysis of variance, covariance, and nonparametric techniques. *Prep. 19.801 or equivalent.*

**19.806 Psychological Scaling**

Measurement theory, psychophysical methods, examples of various scales used in psychology.

**19.807 Mathematical Models**

Several theories which generate quantitative predictions of behavior are presented.

**19.808, 19.809, 19.810 Quantitative Methods I, II, III**

A survey of the quantitative methods used in psychology. The following topics will be considered with emphasis on their application to psychology: basic theory of functions and relations, curve fitting, derivation and analysis of familiar distribution and probability functions, elementary set theory, elementary statistics, and analysis of variance.

**19.814 Information-Processing Models in Psychology**

Sensory systems considered as information-flow channels, with emphasis on the visual system. Topics to be discussed include: Selection and encoding of sensory information, the effects of neural inhibition and feedback, and applications of linear systems analysis to sensory systems.

**19.815 Signal Detection Theory Seminar**

This seminar is directed towards the general theory of signal detectability and its application to psychophysical experiments. First, the seminar will consider the general theory of signal detectability at its current state of development. Then, it will consider appropriate procedures for data collection and analysis in order to fit them into the signal detection context.

**19.817, 19.818, 19.819 General Experimental Psychology I, II, III (4 q.h.)**

These three courses provide the fundamentals of sensory processes, perception, learning, cognition, personality, social, and physiological psychology.

**19.827 Chemical and Tactile Senses**

Anatomical, physiological, and behavioral data will be examined with respect to the current problems of quality coding and psychophysical correlates. Both animal and human data will be covered in the seminar.

**19.828, 19.829 Psychoacoustics I, II**

Seminars will cover a wide range of topics in psychological and physiological acoustics including theories of pitch perception, models of loudness, dichotic listening, speech perception, anatomy, and auditory pathology. Opportunities will be available for seminar reports based on the students' own experimental work.

**19.830 Learning I**

Investigation of contemporary issues in classical and instrumental conditioning. Emphasis will be placed upon a critical analysis of specialized research areas such as secondary reinforcement, discrimination, and generalization.

**19.831 Learning II**

Analysis of current research trends in human learning. Areas of concern and issues include serial learning, paired associate learning, and verbal behavior. *Prep. 19.830.*

**19.833 Perception**

A detailed consideration of research in such areas as form, space and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena will be considered.

**19.835, 19.836 Learning and Behavioral Analysis**

These two seminars will cover contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, comparative psychophysics, and physiological psychology.

**19.840, 19.841 Physiological Psychology I, II**

Fundamental concepts and techniques in physiological psychology.

**19.844, 19.845, 19.846 Physiological and Comparative Psychology I, II, III**

Seminars: a shared background, key concepts, and central issues of the field of physiological and comparative psychology.

**19.847, 19.848 Mammalian Neuroanatomy**

A study of the anatomy of the nervous system including its embryological development. Major emphasis will be given to the central nervous system including its ultrastructure.

**19.849 Historical and Philosophical Backgrounds of Psychology I**

A detailed review of the history of experimental psychology from its beginnings in the nineteenth century to the present. Antecedent and concomitant developments in philosophy and the natural sciences will be considered.

**19.850 Historical and Philosophical Backgrounds of Psychology II**

Advanced seminar in selected topics in the historical and philosophical foundations of experimental psychology.

**19.860, 19.861 Vision I, II**

Seminars: classical and modern problems in vision. Recent journal articles will provide primary source materials for discussion. Consideration will be given to problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

**19.870, 19.871, 19.872 Research in Cognition and Psycholinguistics I, II, III**

Seminars: current research and theory in such areas as concept attainment, problem solving, long and short term memory, language acquisition, perception of language, transformational grammars, and linguistic competence.

**19.880, 19.881 Sensory Psychophysiology I, II**

Concentration on the anatomy and physiology of the various sensory systems, and correlation of these data with psychophysical and perceptual concepts. Laboratory work will be included.

**19.883, 19.884 Psychophysiology I, II**

Selected topics on the interdependencies among behavioral and physiological regulatory systems; thermoregulation, respiration, cardiovascular functions, etc.; their relations to central and autonomic control and to behavioral mechanisms; reactions to stressors, physiological conditioning, orienting behavior.

**19.886, 19.887, 19.888 Departmental Research Seminar I, II, III (2 q.h.)**

Weekly colloquia devoted to the presentation of current research by members of the faculty, graduate students, and invited guests.

**19.901 Personality I**

Following a survey of the Freudian conceptualization of the normal personality and its development, the course will examine critically the experimental evidence bearing upon a number of concepts (e.g., anxiety, repression, aggression) basic to psychoanalytic theory.

**19.902 Personality II**

A survey of recent developments in personality theory, and an examination of the experimental evidence bearing upon the relevant assumptions and concepts (e.g., cognitive styles, need for achievement). *Prep. 19.901.*

**19.905, 19.906 Personality Theory and Research I, II**

Seminars: A critical examination of the fundamental concepts and assumptions of several major personality theories, based on a survey of recent research in personality. Characteristic problems in personality research will also be considered.

**19.920, 19.921 Social Psychology I, II**

Group phenomena and the influences of the group upon the thought and behavior of the individual. Such topics as social interaction, perception, opinions, attitudes, leadership, and social conflict will be discussed.

**19.940, 19.941 Experimental Child Psychology I, II**

Selected topics in child behavior and development with emphasis on current research.

**19.980, 19.981, 19.982 Research Methods I, II, III**

Instrumentation and laboratory techniques through instruction and participation in ongoing laboratory projects.

**19.990 Special Topics in Psychology (maximum: 9 q.h.)****19.991 Thesis (6 q.h.)**

Experimental work for the master's degree requirement.

**19.992 Research Problems (6 q.h.)**

Experimental or theoretical work for master's degree candidates.

**19.995 Dissertation**

Experimental and theoretical work for Ph.D. candidates.

# sociology and anthropology

## **Professors**

Norman Kaplan, Ph.D.,  
Chairman  
Blanche Geer, Ph.D.  
Frank F. Lee, Ph.D.  
Earl Rubington, Ph.D.  
Stephen Schafer,  
D. Jur., Prof. Agrégé

## **Associate Professors**

Mary Catherine Bateson, Ph.D.  
Morris Freilich, Ph.D.  
Elliott A. Krause, Ph.D.  
Morton Rubin, Ph.D.

## **Assistant Professors**

Patricia Golden, Ph.D.  
David H. Kamens, Ph.D.  
Jack Levin, Ph.D.

## **Instructors**

Marcia Garrett, M.A.  
Leila Leibowitz, M.A.

## **Admission**

In addition to the admission requirements listed on page 23, applicants should have had a program including at least 15 semester hours of sociology or anthropology, but qualified applicants with less than this amount of course work will be considered on an individual basis. Students whose background in sociology or anthropology is deficient may be asked to take basic courses in addition to the regular requirements. The Miller Analogies Test may be submitted as further evidence of academic promise.

## **THE MASTER'S DEGREE**

The department offers graduate programs that lead to a master of arts degree in sociology or social anthropology. Forty-two quarter hours of academic work are required. Graduate courses in other departments and advanced undergraduate courses may be taken for credit with approval in advance from the chairman of the committee on graduate studies. Students must maintain at least a B average.

In general, students are encouraged to fashion a program of studies best suited to their needs and capabilities instead of following any single set of rigid requirements. To this end, all entering students

should consult with the chairman of the committee on graduate studies regarding the initial choice of a faculty adviser before registering for courses.

For the Master of Arts in Sociology, students are generally required to take two quarter courses each in theory (usually 21.805 and 21.806) and methodology (usually 21.810 and 21.811). The statistics requirement may be satisfied by achieving at least a B in 21.814 or its equivalent. All students are strongly advised to take some work in social anthropology.

For the Master of Arts in Social Anthropology, students are generally required to take two quarter courses each in theory (usually 20.801 and 20.802) and methodology (usually 20.805 and 20.806). Other requirements will be individually determined. All students are strongly advised to take some work in sociology.

Students who can demonstrate proficiency to the satisfaction of the committee on graduate studies in any of the requirements need not take those particular courses.

A master's paper is required and earns four quarter hours of credit. This paper may be based on empirical or library research, and must meet criteria for publication in a professional journal. It is expected that the full-time student will complete his master's paper no later than the end of his second year. Students planning to go on for the Ph.D. should consider taking the qualifying examination scheduled in the spring of their second year.

### **THE DOCTOR OF PHILOSOPHY DEGREE**

The department offers the Ph.D. in sociology. A limited number of students will be enrolled in the Ph.D. program so as to provide highly personalized study and research training with individual supervision.

#### **Admission**

Applicants to the doctoral program should apply for admission not later than March first of the year in which they expect to complete the requirements for the master's degree.

#### **Residence Requirement**

The university's residence requirement can be satisfied by one year of full-time graduate work or its equivalent beyond the Master of Arts degree. Most students should expect to spend approximately two years or the equivalent in full-time graduate study beyond the requirements of the master's degree.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general regulations of the graduate school.

### **Qualifying Examination**

Students will be examined on their basic knowledge of sociology, especially theory and research methods, during the first year after fulfillment of course requirements for their Master of Arts degree. Students entering the program with a master's degree from another institution should take the qualifying examination at the earliest opportunity after enrolling at Northeastern University.

### **Course Requirements**

Generally, forty-two hours of academic work beyond the master's degree are required. However, the actual number needed by any particular student will be specially determined in each case. Depending on background, experience, and performance, a greater or lesser number of formal courses may be required. The Committee on Graduate Studies, together with the student and his adviser, will make recommendations to the department. All courses will be approved by the student's adviser and the departmental graduate committee. Students entering from another university may be required to take certain basic courses before proceeding with the doctoral program.

### **Language Requirements**

A reading knowledge of French and German is required. Another language, or "tool" subject, may be substituted for either French or German if deemed essential for the student's future career. Petition for such substitutions must be submitted for approval to the department graduate studies committee. The language requirements must be satisfied before admission to the comprehensive examination.

### **Comprehensive Examination**

During the period of doctoral degree candidacy, each student must pass a comprehensive examination. This will cover sociology (including theory and methods) and social anthropology. The comprehensive examination must be passed at least nine months before the commencement at which the Ph.D. is to be awarded.

### **Doctoral Dissertation**

The student must submit a prospectus describing the topic of his doctoral dissertation, his methods of research, and the theoretical relevance of his problem. This prospectus must be approved by the departmental graduate studies committee. A dissertation committee, consisting of the dissertation adviser, two readers within the department, and one reader from outside the department, will be appointed. The dis-

sertation committee will be responsible for approval of the dissertation before the final defense. A finished draft of the dissertation must be available to the department in three copies at least six weeks before the commencement at which the degree is to be awarded.

### **Final Oral Examination**

The dissertation will be defended after completion of all other requirements for the doctoral degree. This oral defense will be held approximately four weeks after the dissertation has been accepted by the dissertation committee, and at least two weeks before the commencement at which the degree is to be awarded.

## **DESCRIPTION OF COURSES**

*All courses carry three quarter hours of credit unless otherwise specified.*

### **SOCIAL ANTHROPOLOGY**

#### **20.801 Theories of Social Anthropology I**

History of major contemporary orientations in the field. Evolutionary approaches, culture area, and historical analysis.

#### **20.802 Theories of Social Anthropology II**

Contemporary theoretical approaches neo-evolutionism, structuralism, functionalism, role structure, comparative methods, social relations approaches. *Prep. 20.801.*

#### **20.803 Theories of Social Anthropology III**

Strategy of model building. Models of kinship structures and of more complex systems. *Prep. 20.802.*

#### **20.805 Research Methods in Anthropology**

Data collection through participant observation, use of personal documents, and various analytic methods in ethnology.

#### **20.806 Field Work (4 q.h.)**

Data pertaining to problems in 20.805 will be collected from the general Boston area, and attempts will be made to develop these pilot projects into carefully designed projects. *Prep. 20.805.*

#### **20.807 The Analysis of Field Data (4 q.h.)**

Intensive analysis of field data including description, hypothesis testing, and the presentation of research findings. Students will analyze field data collected in 20.806. *Prep. 20.806.*

#### **20.810 Primitive Social Organization**

Institutions of primitive societies. The dynamics of continuity and change of culture and social organization.



**20.815 Tribal Societies and Culture**

The structures and institutions of bands, tribes, and chiefdoms: comparative and functional studies of tribal societies and the dynamics of change under contact situations.

**20.820 Peasant Society and Culture**

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industrialized societies.

**20.825 Language and Culture I**

Human communication, including language. The fundamentals of linguistic analysis and their extension to other aspects of culture. Language and thought.

**20.826 Language and Culture II**

Communication in nonhuman societies. Theories of the evolution of language. Language and thought. *Prep. 20.825.*

**20.830 Culture and Personality**

Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed.

**20.835 Kinship and Social Structure**

A variety of kinship systems and their terminological and structural components and the way in which their systems articulate with other social institutions. *Prep. 21.810.*

**20.836 Family in Evolutionary Perspective**

The emergence of family from pre-human patterns, its biological and behavioral components, and its cross-cultural variations examined from an evolutionary perspective.

**20.840 Comparative Community Studies**

Intensive review of community studies in developed and developing areas. Examination of methods for comparative analysis.

**20.850 Comparative Religion**

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization.

**20.860 The Cultural Ecology of Tribal and Peasant Societies**

Types of economic systems in simple societies: reciprocal, redistributive, market exchange. Economic relations as part of social relations: land tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economies.

**20.870 Anthropology of History**

Origins and growth of the institutions of civilization; specialization, social stratification in the dynamics of traditional civilizations. Also, some special topics of contact and change.



**20.880 Latin American Cultures**

Focus will be on Meso-America. Examination of Aztec and Mayan cultures and their influences. The effects of the Spanish Conquest on the area will be studied. Analysis made of present-day tribal, peasant, and complex cultures.

**20.885 Peoples and Cultures of the Indian Subcontinent (India, Pakistan, Ceylon, Nepal, Sikkim and Bhutan)**

An introduction to the peoples of the Indian subcontinent. Special topics of concentration will include belief systems, caste, politico-economic organization, racial and linguistic diversity, and social change.

**20.930, 21.930 Social and Cultural Change A, S**

*Two-quarter course, in conjunction with Sociology.*

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

**20.950, 20.951, 20.952 Directed Study in Social Anthropology (maximum: 9 q.h.)**

Reading and empirical research in social and cultural anthropology supervised by members of the anthropological staff. *Prep. 20.806.*

**20.980 Contemporary Issues in Social Anthropology**

Contemporary issues in the field of anthropology. Supervised readings and written reports on special problems.

**20.990 Seminar (maximum: 9 q.h.)**

Discussion of selected topics in the field of anthropology.

**20.991 Master's Paper in Social Anthropology**

Empirical or library research meeting the criteria for publication in a professional journal. *Supervision by members of the department.*

## SOCIOLOGY

**21.805 Foundations of Social Theory**

The classic theorists of sociology will be considered in an intensive and critical manner. The works of St. Simon, Comte, Marx and Weber, Pareto, Mosca, and Durkheim and his school will form the core of the course.

**21.806 Contemporary Sociological Theories**

Main concepts of modern social theory, with special emphasis on functional theory, conflict theory, and symbolic interactionism. Authors such as Parsons, Merton, L. Coser, R. Dahrendorf, and The Chicago School will be considered. *Prep. 21.805.*

**21.807 Recent Developments in Sociological Theory**

New horizons in theory and the relation of theory to research. Topics to be selected each year and announced by the instructor. *Prep. 21.806.*

**21.809 Seminar in Symbolic Interaction**

The social psychology of groups as found in the works of Mead, Becker, Blumer, Goffman, and others.

**21.810 Introduction to Research Methodology (4 q.h.)**

Methodology of empirical social research including survey techniques, interviewing, questionnaire construction, sampling procedures, and the logic of research design. Students will take part in a survey.

**21.811 Survey Methods in Social Research (4 q.h.)**

The processing and analysis of survey data, including index construction, the interpretation of statistical relationships, and the presentation of research findings. Students will analyze survey data collected in 21.810. *Prep. 21.810.*

**21.812 The Logic of Social Inquiry**

An examination of the assumptions underlying empirical investigations in sociology. Rules of correspondence between empirical fact and abstract theory, the development and formalization of theory, and deductions from axiomatic theory. The techniques of formal logic as they apply to sociological theory are also discussed. *Prep. 21.811.*

**21.813 Univariate Statistics (4 q.h.)**

Measurement and description of univariate distributions. An introduction to probability, sampling, and the estimation of parameters and confidence intervals will be included.

**21.814 Bivariate Statistics (4 q.h.)**

The use of t-test, simple analysis of variance, correlation, regression, Chi-square, and other nonparametric techniques for determining the independence of samples and the relationship between variables. *Prep. 21.813 or equivalent.*

**21.815 Multivariate Statistics (4 q.h.)**

Higher order analysis of variance and covariance, multiple and partial correlation, factor analysis, and latent structure analysis. The course will be conducted as a seminar, with each student concentrating on one or two of the multivariate techniques. *Prep. 21.814.*

**21.816 Computer Methods in Social Research (4 q.h.)**

Computer applications in data processing and analysis, network analysis, and simulation models. Rudimentary programming and the availability and use of "packaged" programs will be covered. *Prep. 21.815.*

**21.817 American Society**

Study of the development of and the changes in the institutional structure of American society in comparison with certain other social systems.

**21.818 Data Resources in Social Research**

The sources and uses of demographic and organization data in social research, particularly in conjunction with survey data. Special attention will be given to the methodological problems in the use of census and data bank resources and how to use them and data processing aspects of contextual analysis. *Prep. 21.811.*

**21.820 Sociology of Deviant Behavior**

Applications of sociological concepts and principles to some problems of social disorganization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling. *Prep. 21.806.*

**21.825 Sociology of Crime**

Analysis of the crime factors, criminal typology, occasional and professional criminals, habitual criminality, abnormality and crime, white-collar criminals, the criminal crowd, social implications.

**21.827 Sociology of Delinquency**

Social and psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

**21.830 Penology and Corrections**

Police, court, corrections. The penal system and its treatment methods. Prison. Capital punishment. Probation and conditional sentencing. The inmate society. Parole. After-care. Social consequences of crime.

**21.831 Criminal Law**

The development and principles of American criminal law. The characteristics of major crimes. The Model Penal Code of the American Law Institute. Administration of criminal justice. The theory and practice of Supreme Court decisions.

**21.835 Theories of Criminology**

Theories and philosophies, underlying various correctional systems. Schools of thought in criminology and penology. Theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

**21.837 Sociology of Law**

Fundamentals of law. The concept of social control. Order and Law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. Analysis of some legal institutions.

**21.840 Sociology of Medicine**

Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

**21.843 Sociology of Education**

The structure and functioning of educational institutions. Student, faculty, and administrative perspectives. Emphasis will be placed on the role of education in processes of socialization, social mobility, social change, and social control.

**21.847 Formal Organizations**

Analysis of the goals, functions, and consequences for the individual in modern organizations. Aspects of bureaucratization will be examined within business firms, public institutions, and private associations.

**21.850 Sociology of Occupations and Professions**

The relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

**21.855 Political Sociology**

Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

**21.857 Economic Sociology**

The role of economic factors in the social process. Consideration will be given to both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially model-building approaches) and general sociological problems.

**21.860 Intergroup Relations**

The relations between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

**21.863 Sociology of Religion**

A sociological analysis of religious institutions and experiences in their historical and contemporary content. Religion and political content will be considered.

**21.865 Sociology of Knowledge**

The relationship between the social base of a society and its intellectual products. The view points of authors such as Marx, Weber, Mannheim, G. H. Mead, the Neo-Marxian, and other modern schools will be considered. *Prep. Three terms of graduate theory.*

**21.870 The Family**

Social structure and social functions of the family as a social institution. Relations between the family and other institutions in society will be examined comparatively and historically.

**21.873, 21.874 Childhood and Adolescence I, II**

Growth and development of the child in the social context. Primary socialization in the family including the transmission of role expectations, values, and the development of self concept. Secondary group socialization in school, neighborhood, and peer group.

**21.877 Theories of Socialization**

A critical examination of the major theories in the field. Attention will be focused on the work of Freud, Piaget, Cooley, Mead, Parsons, and Merton.

**21.880 Community Analysis**

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of methods for community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

**21.885 Urban Sociology**

Theories of the development of urban life. Comparisons between pre-industrial and industrializing urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

**21.886 Seminar in Urban Social Research Issues**

Social science theories and methods are evaluated from the perspectives of urban affairs research. *Consent of instructor.*

**21.890 Middle East Area Study**

Socio-cultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Comparative regional analysis.

**21.895 Latin American Societies**

Study and analysis of selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasis on urbanization and industrialization, social and political change.

**21.900 Issues in Social Psychology**

Human behavior and theories of self from a sociological and psychological perspective. Special consideration of interpersonal relations, socialization, and symbolic interaction.

**21.910 The Sociology of Science**

Selected topics dealing with interactions between science and society. *Consent of instructor.*

**21.912, 21.913 Experimental Methods in Social Research I, II**

This course covers experimental design and laboratory methods in sociology. The small groups laboratory is treated as a setting for testing sociological theory. The emphasis is upon techniques and problems in the creation and manipulation of social variables in the laboratory situation, although the techniques of the natural experiment are also considered.

**21.916, 21.917 Seminar in Qualitative Analysis I, II**

**First Quarter:** Social Structure process and meaning in interacting groups. Each student studies a face-to-face group by means of participant observation using symbolic interaction concepts. **Second Quarter:** Situational analysis of field data. The relation of method and theory. *Consent of instructor.*

**21.918, 21.919 Seminar in Quantitative Analysis I, II**

Selected topics such as measurement error, sampling bias, the interchangeability of indices, ecological correlation, and contextual analysis. Students will take part in an extended analysis of quantitative data which illustrates these issues.

**21.920 Social Stratification**

Theories of inequality between groups in historical perspective, from classical to modern industrial times. Discussion and evaluation of sociological research in social stratification in regard to different social and cultural groups.

**21.930, 20.930 Social and Cultural Change S, A**

*Two-quarter course, in conjunction with Anthropology.*

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

**21.940, 21.941 Social Control I, II**

Seminar in research, theories, and methods in the sociology of social control.

**21.950, 21.951 Seminar in Social Structure I, II**

Seminar relating current theories and research in sociology, social psychology, and social anthropology.

**21.960, 21.961, 21.962 Seminar on Socialization I, II, III**

I. Instructor reviews theories and findings in organizational socialization. II. Students design studies in organizational socialization. III. Students present results of their studies. *Not open to first year students.*

**21.980 Contemporary Issues in Sociology**

Contemporary issues in sociology. Supervised readings and written reports on special problems.

**21.990 Seminar (maximum: 9 q.h.)**

Discussion of selected topics in the field of sociology.

**21.991 Master's Paper in Sociology**

Supervision by members of the department. Empirical or library research meeting the criteria for publication in a professional journal.

**21.992, 21.993, 21.994 Directed Study in Sociology (Maximum: 9 q.h.)**

Reading and research under the direction of a faculty member. *Open to doctoral candidates with the consent of the graduate committee.*

**21.995 Doctoral Dissertation**







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## UNDERGRADUATE COLLEGES

*Offering full-time day curricula on the Cooperative Plan leading to baccalaureate degrees*

Boston-Bouvé College	College of Engineering
College of Business Administration	College of Liberal Arts
College of Criminal Justice	College of Nursing
College of Education	College of Pharmacy

*Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees*

Lincoln College  
University College



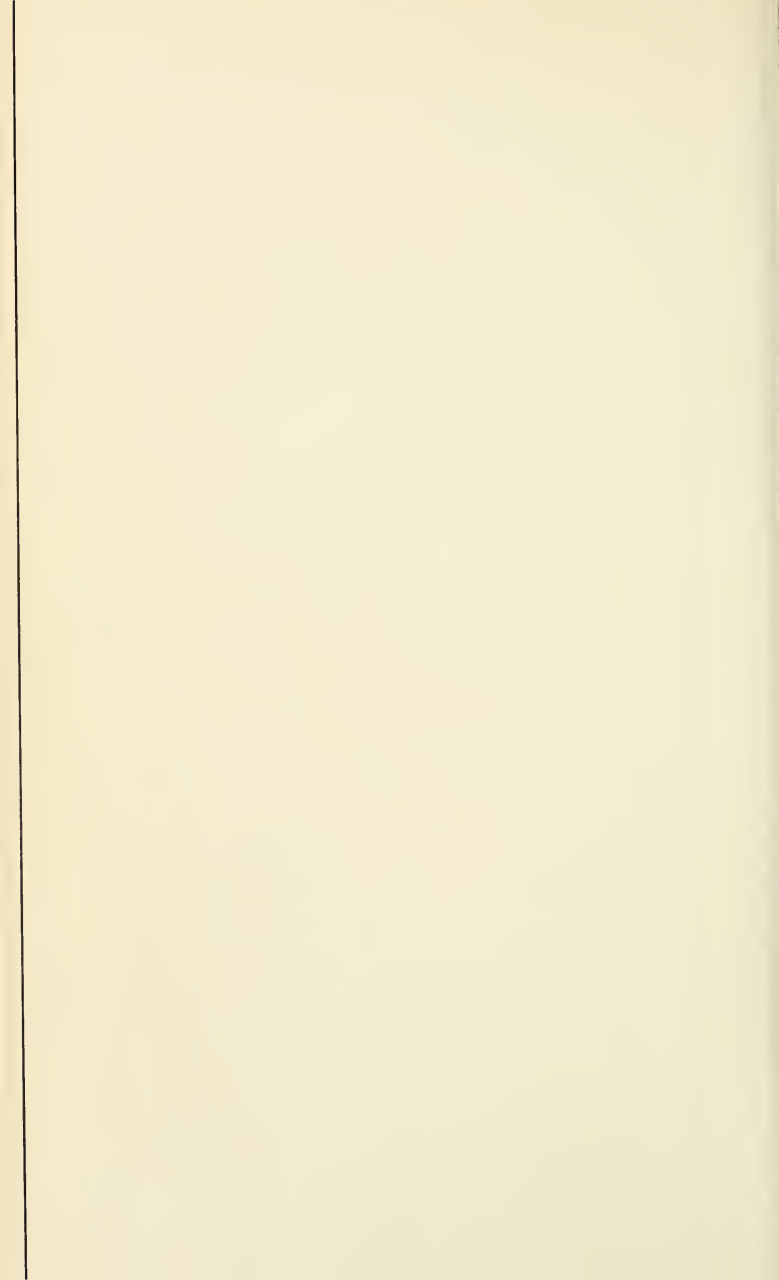




northeastern university



graduate school of business administration  
1971-1972





# northeastern university

graduate school of business administration

1971-1972

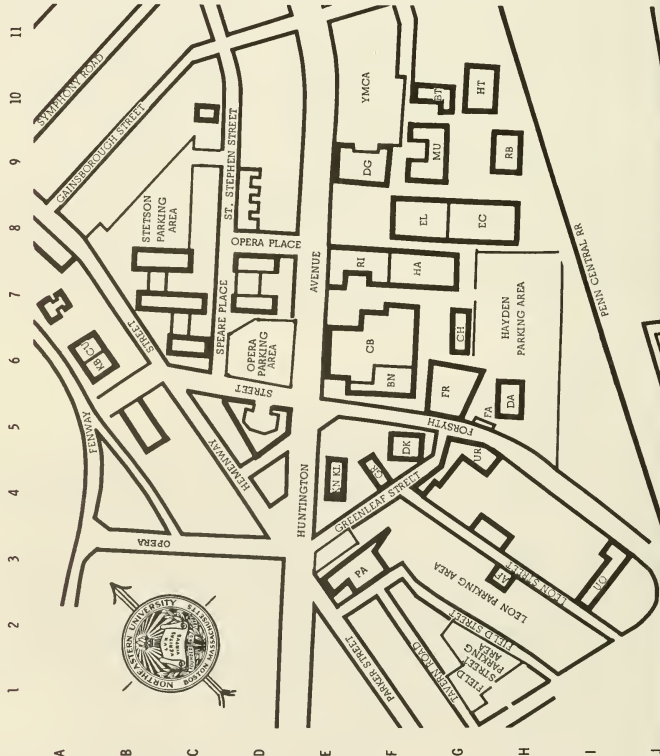


Northeastern University  
224 Hayden Hall  
360 Huntington Avenue  
Boston, Massachusetts 02115  
Tel. (617) 437-2714



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<u>Building</u>	<u>Building Designation</u>
Barletta Natatorium	BN
Botolph Building	BT
Cabot Physical Education Ctr.	CH
Churchill Hall	CU
Dana Research Center	DA
Dockser Hall	DK
Dodge Library	DG
Eli Student Center and Alumni Auditorium	EL
Forsyth Building	FR
Forsyth Building Annex	FA
Forsyth Dental Building	FD
Greenleaf Building	GL
Hayden Hall	HA
Hurtig Hall, (Chemistry)	HT
Kennedy Building	KB
Knowles Center (Crim. Justice)	KN
Knowles Center (Law)	KL
11 Leon Street	LO
Afro-American Institute	AF
Mugar Life Sciences Building	MU
Parker Building	PA
Richards Hall	RI
Robinson Hall	RB
United Realty Building	UR

**ACADEMIC CALENDAR 1971-72**

**Fall Quarter 1971**

Registration period (1:00-3:00 and 5:30-8:00 p.m., Boston and Burlington only)		
Burlington	Tuesday-Wednesday	September 14-15
Boston	Monday-Friday	September 20-24
Nashua (5:30-7:00 p.m.)	Wednesday	September 22
Classes begin	Monday	September 27

**Winter Quarter 1971-1972**

Registration period (1:00-3:00 and 5:30-8:00 p.m., Boston and Burlington only)		
Burlington	Tuesday-Wednesday	Nov. 30-Dec. 1
Boston	Monday-Friday	December 6-10
Nashua (5:30-7:00 p.m.)	Wednesday	December 8
Classes begin	Monday	January 3

**Spring Quarter 1972**

Registration period (1:00-3:00 and 5:30-8:00 p.m., Boston and Burlington only)		
Burlington	Tuesday-Wednesday	March 7 & 8
Boston	Monday-Friday	March 13-17
Nashua (5:30-7:00 p.m.)	Wednesday	March 15
Classes begin	Monday	April 3
Last day to file for Spring		
Commencement	Monday	April 3
Commencement	Sunday	June 18

**Summer Quarter 1972 (first six-week session)**

Registration period:		
Burlington (5:30-8:00 p.m.)	Monday-Tuesday	June 19 & 20
Boston (5:30-8:00 p.m.)	Wednesday-Friday	June 21-23
No classes at Nashua		
Classes begin	Monday	June 26
Last day to file for		
Fall Commencement	Friday	June 30

**Summer Quarter 1972 (second six-week session)**

Registration period		
Burlington (5:30-8:00 p.m.)	Monday-Tuesday	July 31-August 1
Boston (5:30-8:00 p.m.)	Wednesday-Friday	August 2-4
Classes begin	Monday	August 7

## UNIVERSITY HOLIDAYS 1971-1972

Columbus Day	Monday	October 11
Veterans' Day	Monday	October 25
Thanksgiving Recess	Thursday-Saturday	November 25-27
Christmas Vacation	Tuesday-Sunday	December 21-January 2
Washington's Birthday	Monday	February 21
Patriots' Day	Monday	April 17
Memorial Day	Monday	May 29
Independence Day	Monday	July 4

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1970-1971

The Council determines broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

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 Roy L. Wooldridge, *Vice President and Dean of Cooperative Education*

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*(Terms expire Sept. 1971)*

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 Warren Briggs, *Associate Professor of Management*  
 Austin W. Fisher, *Professor of Mechanical Engineering*  
 Bill C. Giessen, *Associate Professor of Chemistry*  
 Bernard M. Goodwin, *Associate Professor of Chemical Engineering*  
 Charles Haley, *Assistant Dean, College of Education*  
 Maurice Kaufman, *Associate Professor of Education*  
 Philip McDonald, *Associate Professor of Marketing and Management*  
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 Albert H. Soloway, *Professor and Chairman of Medicinal Chemistry*

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 Geoffrey Crofts, *Director of the Graduate School of Actuarial Science*  
 Joseph Golemme, *Director of the Graduate School of Professional Accounting*

George W. Hankinson, *Director of the Graduate School of Engineering*  
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**1971-1972**

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Dharmendra Verma, *Associate Professor of Marketing*  
Frank Schettino, *Coordinator of Graduate Cooperative Education*



# the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 170 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouv  College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, the pharmaceutical sciences, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

## **GRADUATE AND PROFESSIONAL SCHOOLS**

The nine graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmaceutical Sciences offers the degree of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science.

### **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

### **RESEARCH ACTIVITIES**

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# buildings and facilities

## MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

## Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

## Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 250,000 volumes supplemented by some 356,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 1,800 periodical titles, 90,000 documents, and 2,300 sound recordings.

### **Cabot Physical Education Center**

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouv  College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

### **Dockser Hall**

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

### **Apartments for Graduate Students**

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

## **SUBURBAN FACILITIES**

### **Suburban Campus**

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

**Warren Center**

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

**Henderson House**

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

**Marine Science Institute**

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

**Nashua Campus**

For students residing in the southern New Hampshire area, the Graduate School of Business Administration offers a major portion of its M.B.A. Program at facilities in Nashua, New Hampshire. These facilities, made available by Sanders Associates Inc., are located in their headquarters on Route 3, just over the Massachusetts line.





# graduate school of business administration

The Graduate School of Business Administration at Northeastern University offers a program leading to the degree of Master of Business Administration. Broad in concept, it is aimed at preparing the student for a career in administration rather than for an immediate or particular position. The curriculum and teaching methods center around the development of basic skills and knowledge appropriate to administration, rather than upon specialized functional techniques. Although the case method of study is extensively used, a variety of teaching methods is employed consonant with particular course objectives. The basic objectives of the program are: to confront the student with meaningful learning experiences, to increase skills and knowledge in basic disciplines underlying administrative practice, and to develop judgment and skills of problem analysis and decision-making in complex organizations.

The student may choose one of four methods of securing an M.B.A. degree: full time, full-time internship, full-time assistantship, and part-time study. The full-time student may complete the program in one calendar year of academic study.

The full-time program allows students wide latitude in determining their pace toward the M.B.A. degree. They may elect to take four, five, or six courses each quarter, enabling them to complete the degree requirements in a period of from one calendar year to two academic years.

The full-time internship blends one full calendar year of academic study with nine months of coordinated work as an intern in a business or nonprofit organization. This combination of theory and practice gives the intern excellent preparation for a career in management.

Under the full-time assistantship, students combine their studies with academic experience in the College of Business Administration.

Part-time students have the advantage of attending classes in the late afternoon and evening to learn the theory behind the practical application of their employment.

## INTERNSHIP

A feature which makes the Northeastern M.B.A. program unusual in graduate education is the management internship. Following the theory that a balanced exposure to theory and practice is the most effective approach to management education, the two-year program affords excellent opportunity in each area. Class work begins with basic disciplines vital to sound progress in a management-oriented course. The functional areas of business are treated next, with process courses and electives following.

Interwoven with the academic quarters are two periods of guided experience in business and other organizations. One period is three months in duration; the other, six months. The intern works in an administrative capacity in a realistic organizational environment from which a major source of funds may be obtained for continuance of the program. The nature of the job will assure ample opportunity to observe, research, and report upon some aspect, element, or problem of the organization. The experience entails a report which will be considered within the academic portion of the program.

Because of economic, academic, and individual variables, the Graduate School cannot guarantee placement; however, the University has a full-time experienced staff to assist the student in obtaining his internship. Students are also encouraged to investigate employment opportunities on their own in order to facilitate final placement by the intern coordinator.

An illustration of term sequence within the two-year intern program is shown below.

	1st Year	2nd Year
<b>Fall Quarter</b>	In Class	Management Internship
<b>Winter Quarter</b>	In Class	Management Internship
<b>Spring Quarter</b>	Management Internship	In Class
<b>Summer Quarter</b>	In Class	

During each academic quarter, the student will normally carry 18 hours of course work.

## ASSISTANTSHIP

A student may be a teaching assistant, a graduate administrative assistant, or a Northeastern Fellow. Appointees to these positions work directly with members of the faculty and staff of the College of Business Administration. This work affords the student interested in developing a college or university career the opportunity to explore and gain experience in teaching, research and/or administration.



*Teaching assistants and graduate administrative assistants* receive remission of tuition and a stipend of \$2,600 in return for devoting half time to assisting directly in the teaching process or in administrative duties within the College. These appointees must not take less than a half-time academic load in the M.B.A. Program. M.B.A. candidates who are in the second year of study and receive these appointments are paid a stipend of \$2,800.

*Northeastern Fellows* receive remission of tuition in return for sharing in the administrative work of the College. These awards are normally given to full-time students in their first year of graduate work. Northeastern Fellows devote the equivalent of one day per week to their assigned administrative work within the College.

### **Appointments**

Appointments to assistantships and fellowships are ordinarily announced no later than May 1st for the following academic year. They are for a maximum of one year and can be renewed only by reappointment. Students who hold assistantships or fellowships are expected to devote full time to their studies and the responsibilities of the award. They may not accept outside employment without the consent of the Director of the Graduate School of Business Administration.

### **PART-TIME STUDY**

Part-time students can continue their full-time employment while acquiring the background, skills, and knowledge that will help them advance their career in administration.

These students normally take two courses per quarter and can complete the degree program in three to four years, depending upon whether course work is taken during the summer quarter. All degree requirements may be completed at either the Boston or Suburban Campus in the late afternoon and evening hours.

Students maintaining a satisfactory academic standing may petition the Director of the Graduate School of Business Administration for permission to take more than two courses per quarter.

### **GENERAL REGULATIONS**

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

## Application

All applicants should address inquiries to the Graduate School of Business Administration. Application forms and reference blanks will be mailed to the applicant. This material, together with official transcripts, the Admission Test for Graduate Study in Business (ATGSB) scores, and the results of the Test of English as a Foreign Language (TOEFL, required of all applicants whose native language is not English) should be returned to:

Northeastern University  
Graduate School of Business Administration  
224 Hayden Hall (Admissions)  
Boston, Massachusetts 02115

Applications for the ATGSB Examination can be obtained by writing to:

Educational Testing Service  
Box 966  
Princeton, New Jersey 08540

Applications for the TOEFL Examination can be obtained by writing to:

Educational Testing Service  
Box 899  
Princeton, New Jersey 08540

ATGSB and TOEFL scores sent to the Graduate School of Business Administration are kept for one year from the date taken.

## Admission

Full-time and full-time internship applications should be submitted by April 1. Applications received after this date are considered if spaces are available in the entering class. Applications for assistantships should be submitted by March 1. Admission decisions are made in the first week of January, February, March, and April; applicants are then notified by mail. Applications for part-time study must be completed no later than two weeks prior to the registration period for the quarter in which the applicant plans to enter the M.B.A. Program.

To be admitted for graduate work in the College of Business Administration, applicants must have completed undergraduate work of high quality and must have obtained a bachelor's degree from a recognized institution of higher learning. The overall quality of undergraduate achievement is considered to be of more importance than the particular field of specialization. *Official* transcripts of all previous undergraduate and graduate work must be submitted to the Graduate School of Business Administration before admission can be considered or an evaluation made.

Applicants are also required to submit three letters of reference from individuals who are familiar with their qualifications for graduate study in Business Administration.

The basic criteria considered in the admissions procedure are: undergraduate grades, the score on the Admission Test for Graduate Study in Business, job experience, and present job level. An overall impression of strength, past success, and motivation to succeed in the Graduate School is sought in the applicants for the program.

Although the M.B.A. Program presumes no particular level of competence in the areas of accounting, economics, statistics, mathematics, and behavioral science, prospective applicants are advised to acquire some background in these areas in their undergraduate work.

### **Academic Classifications**

Students initially entering the M.B.A. Program are classified into one of three groups depending upon their admission credentials:

*Regular Students* are those individuals who meet *in full* all admission criteria based on the standards established by the Committee on Graduate Study in Business Administration.

*Provisional Students* are those individuals whose records do not qualify them for regular admission based on the standards established. Therefore, provisional students must obtain a B average in the first 18 quarter hours of course work in order to continue in the graduate program.

*Special Students* are those individuals who are not pursuing a degree program. They must meet the same admission criteria as regular students and are allowed a maximum of four courses (12 quarter hours) in the program. Special students accruing any deficiencies will not be allowed to continue.

### **Registration**

Part-time students must register during the periods listed on the school calendar. Dates of registration will be specified by letter for students accepted for full-time study.

### **Residence**

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Graduate School of Business Administration for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

### Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

**A Excellent**

This grade is given to those students whose performance in the course has been of very high graduate caliber.

**B Satisfactory**

This grade is given to those students whose performance in the course has been at a satisfactory level.

**C Fair**

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

**F Failure**

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

**I Incomplete**

This grade is given to those students who fail to complete the work of the course.

**S Satisfactory without quality designation.**

**U Unsatisfactory without quality designation.**

These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Deficiencies must be made up within the quarter following that for which the grade of "I" is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

A make-up final examination period will be scheduled by the Graduate School of Business Administration during the sixth week of each quarter. Any student who wishes to take a make-up examination must obtain permission of the Director of the Graduate School of Business Administration by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the Director to defer it to one of the next two quarters.

### **Class Hours and Credits**

All credits at Northeastern University are entered as quarter-hour credits with a quarter hour of credit being equivalent to three-fourths of a semester hour: i.e., 12 semester hours equal 16 quarter hours.

All classes in the Graduate School of Business Administration meet on a quarter basis, with an academic quarter being defined as a term of approximately 12 weeks' duration. In the summer quarter, classes meet in two six-week sessions. The academic calendar at the front of this bulletin should be consulted to determine the opening dates of each quarter.

### **Continuity of Program**

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one quarter, without notifying the Director of the program, will be classified as Inactive.

All Inactive students must submit a written petition to the Director of the program in order to be readmitted to graduate study. Petition forms may be obtained in Room 224 Hayden Hall.

### **Withdrawals**

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Main Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Graduate School of their intention not to withdraw. Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student. Petition forms may be obtained in Room 224 Hayden Hall.

### **Changes in Requirements**

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin.

### **Application for the Degree**

If a commencement card is not filed with the Registrar's Office before the date appearing on the calendar, there is no assurance that the

degree will be granted in that particular year, even though all other requirements have been met. Prompt filing of the commencement card will also assure that the name appears correctly on the diploma.

### **Academic Requirements**

In order to qualify for the M.B.A. degree, an average grade of "B" must be obtained in the total credit hours required for graduation. No more than three extra courses or repeated courses may be taken in order to satisfy this grade requirement.

Any student who receives a grade of less than "B" in four or more degree credit courses may be withdrawn from the program by action of the Committee of the Graduate School of Business Administration.

Within the above limitations, a required course for which a grade of "I" or "F" is received must be repeated with a grade of "C" or better, and may be repeated only once. If a grade of "I" or "F" is received in an elective course, that course may be repeated once with a grade of "C" or better, or another elective course may be substituted for it. If a grade of "C" is received in a required course, that course may be repeated once to obtain a grade of "B" or better.

### **Transfer Credit**

A maximum of 15 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred carry grades of "A" or "B," have been earned at a recognized institution, have not been used toward any other degree, and are relevant to the M.B.A. Program. Students should petition the Graduate School of Business Administration in writing for all transfer credit. Petition forms may be obtained in Room 224 Hayden Hall. Grades on transfer credit are excluded in the computation of the academic average necessary for the completion of the degree requirements.

### **Time Limitation**

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

# financial information

## FINANCIAL OBLIGATIONS

### **Tuition**

Tuition for master's degree candidates and special students is \$48 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

### **Fees**

All applications must be accompanied by an application fee (non-refundable) of \$15. No applications will be processed until the fee has been received by the Graduate School of Business Administration. Checks should be made payable to Northeastern University and sent directly to the Office of the Graduate School of Business, 224 Hayden Hall.

Upon notification of admission, all full-time applicants are required to pay a tuition deposit of \$50. This deposit will be credited to the student's tuition, and is not refundable for those who do not register.

Other fees include a charge of \$10 for late payment of tuition; a final examination make-up fee of \$5; and a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for Northeastern Fellows is \$6.25 each quarter. There is no fee for teaching assistants and administrative assistants. All part-time students on the Huntington Avenue Campus are charged \$.75 a quarter.

All full-time students will pay a nonrefundable University Health Services fee of \$50 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged before graduation.

### **Refunds**

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.



Refunds will be granted in accordance with the following schedule.

Official Withdrawal Filed Within:	Percentage of Tuition Refunded:
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

### **FINANCIAL AID**

Although the Graduate School of Business Administration grants financial aid only in the form of assistantships, Northeastern University does have a limited amount of financial aid for full-time students enrolled in the Graduate School of Business Administration. Information in addition to that below and application forms are available from the Northeastern University Office of Financial Aid. These forms are not available in the Graduate School of Business Administration Office.

#### **Martin Luther King, Jr., Fellowships**

A limited number of full- and half-time Martin Luther King, Jr., Fellowships are available. Holders of these appointments devote full or half time to graduate work.

#### **Appointments**

Appointments to fellowships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

#### **Dormitory Proctorships**

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

#### **National Defense Student Loan Program**

Under the provisions of an act of the Federal government, students carrying an academic load of one half or more are entitled to loans up to \$2,500 for one school year and up to a total of \$10,000 for undergraduate and graduate work. The actual amount of any award will be determined on the basis of need and academic promise.

The repayment period begins nine months after the borrower ceases to carry a half-time load and extends 10 years from that point. Cancellation of up to 50 percent of National Defense Loans, including interest, is allowed for graduates who enter the field of teaching. Up to 100 percent may be cancelled for service in certain areas. Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students and



one month prior to the start of the quarter for which aid is requested for other students.

### **Higher Education Loan Plan**

Educational assistance loans may be available from certain banks in the student's home town. These loans, guaranteed by state agencies, carry an interest charge of seven percent, three percent of which is paid by the Federal government. Graduate students may borrow up to \$1,500 for each year of study up to a maximum of \$7,500 for both undergraduate and graduate work. Monthly repayment begins nine to 12 months after completion of study and extends up to five years.





# faculty

- Robert F. Abbanat, *Visiting Associate Professor of Management, B.S., M.S., Massachusetts Institute of Technology; M.B.A., D.B.A., Harvard University*
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- Richard J. Morrison, *Assistant Professor of Marketing, B.A., M.B.A., Harvard University; D.B.A. Candidate, Harvard University*
- Peggy Musgrave, *Assistant Professor of Economics, Ph.D., Johns Hopkins University*
- A. Howard Myers, *Professor of Industrial Relations, A.B., Cornell University; M.A., Ph.D., Columbia University*
- John M. O'Connell, *Instructor of Accounting, B.S., M.B.A., Northeastern University; Ph.D. Candidate, University of Massachusetts*
- Russell W. Olive, P.E., *Associate Professor of Management, B.S., M.S., Massachusetts Institute of Technology; M.B.A., Boston University; D.B.A., Harvard University*
- Robert E. Otlewski, *Assistant Professor of Management, B.A., Boston College; M.A., Indiana University; Ph.D. Candidate, Indiana University*
- Robert A. Parsons, *Assistant Professor of Management, B.S., B.A., M.B.A., Northeastern University; M.A., Ph.D. Candidate, Boston College*
- Andre P. Priem, *Associate Dean and Director, Graduate School of Business Administration, and Associate Professor of Management; B.B.A., M.A., University of Cincinnati*
- Paul C. Richards, *Assistant Professor of Accounting, B.S., M.B.A., Northeastern University; C.P.A.*
- Herman Rochwarg, *Associate Professor of Management, B.A., Ph.D., Michigan State University*

- Anghel N. Rugina, *Professor of Economics and Finance, B.S., College of Business, Gołatz, Rumania; M.A., Ph.D., Academy of High Studies in Economics, Bucharest, Rumania; Ph.D., University of Freiburg, Germany*
- Richard W. Safford, *Lecturer in Business Administration, B.S., Union College; M.S., University of Michigan; Ph.D., Massachusetts Institute of Technology*
- Richard J. Santos, *Director, Center for Management Development, and Associate Professor, B.S., Salem Teachers College; M.A., Emerson College*
- Daniel C. Scioletti, *Associate Professor of Business Law, B.B.A., Colby College; Ed.M., Boston University; LL.B., Suffolk University*
- Barry Shore, *Associate Professor of Management, B.S., Tufts University; M.B.A., University of Massachusetts; Ph.D., University of Wisconsin*
- Albert Slavin, *Professor of Accounting, Ed.B., Ed.M., Boston University; C.P.A.*
- Jeffrey A. Timmons, *Assistant Professor of Management, A.B., Colgate University; M.B.A., D.B.A., Harvard University*
- John F. Veiga, *Assistant Professor of Management, B.S.I.M., M.A., Gannon College; D.B.A., Kent State University*
- Dharmendra T. Verma, *Associate Professor of Marketing, B.S., University of Bombay; M.B.A., Ph.D., University of Utah*
- Arthur H. Walker, *Professor of Management, A.B., Bowdoin College; M.B.A., D.B.A., Harvard University*
- Edward R. Willett, *Professor of Finance, B.S., Northeastern University; M.A., Ph.D., Harvard University*
- Frederick Wiseman, *Assistant Professor of Marketing, B.S., Tufts University; M.S., Ph.D., Cornell University*





# master of business administration curriculum

Students entering the program must finish 72 quarter hours of graduate credit to complete the Master of Business Administration Program. This requirement applies to both full-time and part-time students. The course content for the internship, assistantship, and part-time programs is the same, except that students in the internship are required to take the Management Intern Report Course (45.996).

## CURRICULUM

Number	Course	Credit Hours
41.811	Basics of Financial and Managerial Analysis . . . . .	3
41.812	Profit Planning and Budgeted Systems Analysis... .	3
41.813	Planning, Decisions and Control Systems . . . . .	3
43.811	Marketing Management I . . . . .	3
43.812	Marketing Management II . . . . .	3
44.811	Financial Management I . . . . .	3
44.812	Financial Management II . . . . .	3
45.805	Operations Management I . . . . .	3
45.806	Operations Management II . . . . .	3
45.815	Behavioral Concepts . . . . .	3
45.816	Organizational Behavior I . . . . .	3
45.817	Organizational Behavior II . . . . .	3
45.825	Business Policy I . . . . .	3
45.826	Business Policy II . . . . .	3
49.901	Managerial Economic Analysis . . . . .	3
49.902	Statistical Analysis and Inference . . . . .	3
49.903	Introduction to Operations Research . . . . .	3
49.919	The Economic, Behavioral and Environmental De- terminants of Demand . . . . .	3
Total Required Credit Hours . . . . .		54
Elective Credit Hours . . . . .		18
Total Credit Hours for Degree . . . . .		72

While the part-time student has some flexibility in the order in which he takes his required work, the schedule below is recommended as a guide:

<i>Quarter</i>	<i>Number</i>	<i>Course</i>
1st Quarter	41.811	Basics of Financial and Managerial Analysis
	45.815	Behavioral Concepts
2nd Quarter	41.812	Profit Planning and Budgeted Systems Analysis
	45.816	Organizational Behavior I
3rd Quarter	41.813	Planning, Decisions and Control Systems
	45.817	Organizational Behavior II
4th Quarter	49.919	The Economic, Behavioral, and Environmental Determinants of Demand
	49.902	Statistical Analysis and Inference
5th Quarter	43.811	Marketing Management I
	49.901	Managerial Economic Analysis
6th Quarter	43.812	Marketing Management II
	49.903	Introduction to Operations Research
7th Quarter	44.811	Financial Management I
	45.805	Operations Management I
8th Quarter	44.812	Financial Management II
	45.806	Operations Management II
9th Quarter	45.825	Business Policy I
		Elective
10th Quarter	45.826	Business Policy II
		Elective
11th Quarter		Elective
		Elective
12th Quarter		Elective
		Elective

### TRANSITION INSTRUCTIONS FOR FORMER STUDENTS

Under changes in the program requirements which became effective in May 1968, students enrolled in the Master of Business Administration Program before that date must fulfill degree requirements by completing the same program under which they originally enrolled. In most cases this is 40 or 42 quarter hours of graduate credit plus any pre-requisite courses. The following cross reference will aid former students enrolled prior to 1968 in deciding what courses are needed to complete their program. Students who enrolled in the program between May 1968 and prior to March 1970 must satisfy the requirement of 64 quarter hours of graduate credit.

<b>Former Courses</b>		<b>New Courses</b>	
<i>Number</i>	<i>Course</i>	<i>Number</i>	<i>Course</i>
41.800	Accounting for Managerial Control	41.811	Basics of Financial and Managerial Analysis
41.801	Control I	41.812	Profit Planning and Budgeted Systems Analysis



41.802	Control II	41.813	Planning, Decisions and Control Systems
43.801	Marketing I	43.811	Marketing Management I
43.802	Marketing II	43.812	Marketing Management II
44.801	Finance I	44.811	Financial Management I
44.802	Finance II	44.812	Financial Management II
45.801	Production I	45.805	Operations Management I
45.802	Production II	45.806	Operations Management II
45.811	Human Relations and Organizational Behavior I	45.815	Behavioral Concepts
45.812	Human Relations and Organizational Behavior II	45.816	Organizational Behavior I
45.821	Business Policy I	45.825	Business Policy I
45.822	Business Policy II	45.826	Business Policy II
49.910	Managerial Economic Analysis	49.901	Managerial Economic Analysis

## ELECTIVE COURSES

In addition to the required courses, students must complete course work in electives to bring their total program to the 72 quarter hours of credit required for the Master of Business Administration degree. All elective courses carry three quarter hours of credit unless otherwise specified.

### Economics

39.805	Business Cycles and Forecasting
39.823	Government Finance
39.825	Fiscal Policy
39.827	Economic Development
39.829	Comparative Economic Systems
39.831	Money and Banking
39.833	International Economics
39.835	Labor Economics

### Finance

44.814	International Financial Management
44.901	Advanced Financial Management
44.921	Investment Analysis
44.923	Seminar in Strategies for Growth Funding
44.924	Mergers and Acquisitions
44.926	Policy Issues in Corporate Money Management
49.952	Seminar in Capital Budgeting

### Marketing

43.814	Consumer Behavior
43.910	International Marketing
43.912	Dynamics of Marketing Management
43.931	Marketing Research
43.934	New Product Development
43.935	Marketing to Low Income Consumers
43.936	Strategy Problems of Mass Distributors
43.941	Industrial Marketing
49.922	Marketing Information Systems

### Human Relations

45.808	Comparative Management
45.819	Interpersonal Behavior
45.820	Psychological Dynamics of Leadership
45.951	Executive Development
45.971	Personnel Management
45.972	Industrial Relations

**General Electives**

- 41.801 International Accounting
- 41.815 Management Control Systems
- 41.862 Tax Factors in Business Decisions
- 45.828 Seminar in Growth Strategies for Corporate Management
- 45.830 Formal Planning Systems
- 45.902 Planning and Control of Manufacturing Operations
- 45.960 Organizational Theory in Industrial Practice
- 45.961 Business Participation in Metropolitan Problems
- 45.962 Institutional Environment of Business I
- 45.964 Institutional Environment of Business II
- 45.965 Management of Small Business Enterprises
- 45.968 Management of New Enterprises
- 45.969 Government and Business
- 45.985 Management of Research and Development
- 45.989 Science and Technology: The Challenge to Management
- 45.991 Business Law—Law of Contracts, Agency and Sales
- 45.992 Law of Business Organizations and Negotiable Instruments
- 45.996 Management Intern Seminar
- 45.999 Special Topics in Business Administration (1 to 3 Quarter Hours)
- 48.801 Seminar in Transportation Systems
- 48.901 Business Logistics
- 49.918 Information Theory and Systems
- 49.925 Principles and Methods of Business Research
- 49.932 The Computer and Its Applications I
- 49.933 The Computer and Its Applications II
- 49.935 Computer Applications in Management Science

**ELECTIVES FROM OTHER GRADUATE SCHOOLS**

Courses may also be selected from other graduate programs at Northeastern University, with the permission of the Director of the appropriate program and the Director of the Graduate School of Business Administration.

# description of courses

## **39.805 Business Cycles and Forecasting**

The theory of models is used to show that the business phenomenon varies in accordance with the economic and social system implied, and that there is an economic model (the Walrasian system) where the phenomenon cannot exist, at least not in the form that we know from the history of modern capitalism. The major business-cycle theories are introduced for the purpose of demonstrating their application in forging consistent and efficient policies. A statistical theory of fluctuations in business activity of the United States forms the background for a judgment on policies and their effectiveness. *Prep. 15 Q.H. of Grad. Credit*

## **39.823 Government Finance**

A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationship to principles of economic welfare. Discussions on taxation, tax incidence, tax theory, debt management, and employment levels. *Prep. 15 Q.H. of Grad. Credit*

## **39.825 Fiscal Policy**

Deliberate adjustments in revenues and expenditures for the purpose of obtaining greater economic stability and economic growth. Discussion of neutral fiscal policy, built-in stabilizers, budget management, attainment of full employment, inflation and deflation. *Prep. 15 Q.H. of Grad. Credit*

## **39.827 Economic Development**

The enumeration, delineation, and assessment of variables which determine the level and the nature of economic activity. An introductory discussion of the economic factor in civilization is followed by an examination of the psychological, social, and political influences on economic change. The role of various economic institutions in secular development is analyzed. *Prep. 15 Q.H. of Grad. Credit*

## **39.829 Comparative Economic Systems**

A comparative study of central economic theories and institutions of Capitalism, Socialism, Communism, and the Welfare State. Particular attention to criteria for evaluating success in meeting diverse goals, techniques and problems of planning, and real growth rates. Some attention paid to primitive economics. *Prep. 15 Q.H. of Grad. Credit*

## **39.831 Money and Banking**

The necessary information for an understanding of the nature and functioning of the monetary and banking system of the United States as well as of any other

country of the modern era. The theory of models is used to show how many monetary and banking systems are possible, and how the solution to a given problem (both in theory and practice) depends on the model selected. Monetary issues of international nature are discussed. *Prep. 15 Q.H. of Grad. Credit*

### **39.833 International Economics**

The historical background of the Balance of International Payments of the United States. To understand the nature of the problems in this field, central attention is given to the theory of international trade and capital movements. Further attention is paid to the interpretation and evaluation of the various possible foreign economic policies. Trade agreements and restrictions are also included as a part of the greater issues of international economic development and cooperation. *Prep. 15 Q.H. of Grad. Credit*

### **39.835 Labor Economics**

The economics of wage determination, impact of unions on wages and inflation, the economics of full employment and unemployment, and private and public remedial policies; the labor force, governmental labor legislation, security, unionism, and democracy. *Prep. 15 Q.H. of Grad. Credit*

### **41.801 International Accounting**

New accounting tasks have been created by the significant expansion of international business. Accounting concepts and practices vary from country to country, and they affect international business events and transactions. The course attempts to produce an understanding of national and regional patterns of accounting as they exist and their international implications. *Prep. 41.813, Planning, Decisions and Control Systems*

### **41.811 Basics of Financial and Managerial Analysis**

An introduction to accounting systems, including the development of financial statements. Techniques which scrutinize the statements in order to evaluate the firm's potential in the light of historical data are critically appraised. *Prep. None*

### **41.812 Profit Planning and Budgeted Systems Analysis**

After examining the role which profit maximization plays as an entity objective, alternative courses of action for goal achievement are integrated into a programmed budgeting process. Emphasis is given to the budget as a planning, motivating, coordinating, evaluating, and replanning device. *Prep. 41.811, Basics of Financial and Managerial Analysis*

### **41.813 Planning, Decisions and Control Systems**

A study of the integration and coordination of short-range programs with long-range plans and the control mechanisms which enhance appropriate conformance to the strategic budget. *Prep. 41.812, Profit Planning and Budgeted Systems Analysis*

### **41.815 Management Control Systems**

Management control is the process by which management translates the organizational objectives and strategy into specified goals for attainment in a specified period of time, and secures the effective accomplishment of these goals in an efficient manner. This course deals with systems that facilitate this process, with

particular attention to those designed for use at divisional and top management levels. Among the topics discussed are: measurement of performance of responsibility centers (e.g., divisions, departments, subsidiaries), considerations relevant to setting up investment centers and profit centers, transfer pricing, the control of managed costs (such as research/development and administrative costs), the coupling of incentive compensation with measured performance, the annual planning/budgeting process, and long-range planning. *Prep. 41.813, Planning, Decisions and Control Systems*

#### **41.862 Tax Factors in Business Decisions**

A study of the Internal Revenue Code and its implications for compensation policies, choice of organizational form, corporate reorganizations, and foreign business operations. Mergers and acquisitions and the management of depreciable property are examined in the light of decisions made by the Internal Revenue Service and the tax courts. The emphasis of the course is on discussion and research into corporate income tax problems that affect business decisions. *Prep. 15 Q.H. of Grad. Credit*

#### **43.811 Marketing Management I**

The objectives of Marketing Management I and II are twofold: to provide the student with a comprehensive understanding of basic marketing functions, institutions, and concepts; and to develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and services. Marketing Management I emphasizes product policy, channels of distribution, and pricing. *Prep. None.*

#### **43.812 Marketing Management II**

A continuation of Marketing Management I, with emphasis on advertising, personal selling, sales promotion, and the development of integrated marketing programs of action. *Prep. 43.811*

#### **43.814 Consumer Behavior**

Development of an understanding of consumer attitudes and behavior processes. Various economic and behavioral models of consumer behavior are examined and evaluated as bases for the planning and evaluation of marketing strategies. Text, readings, project. *Prep. 43.812, Marketing Management II*

#### **43.910 International Marketing**

Objective is to develop an understanding of (1) the opportunities and challenges facing the international marketing executive; (2) the decision-making process in marketing goods abroad; and (3) the environmental forces — economic, cultural and political — affecting the marketing process and acting as the constraints for the development of marketing strategies abroad. Lectures, discussions, reports, texts, readings, and cases. *Prep. 15 Q.H. of Grad. Credit*

#### **43.912 Dynamics of Marketing Management**

A capstone marketing course which focuses on the marketing executive's task of interrelating the various functional activities within his department and integrating the resulting marketing programs with the short- and long-term objectives of the firm. Case studies and supplementary readings. *Prep. 43.812, Marketing Management II*

**43.931 Marketing Research**

The major methods and models of marketing research are examined in order to give an understanding of the function of research in decision-making. Specific topics include marketing research as a system of information: information from surveys, information from experiments, economic value of information, sales forecasting and control, and selected applications. Cases, problems, and research project. *Prep. 43.812, Marketing Management II*

**43.934 New Product Development**

The importance of new products to the survival and prosperity of firms is growing and will continue to grow with the continuing shortening of product life cycles, with changes in technology, competition, consumer tastes, and with increasing operating costs. For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This seminar will have as a primary concern the examination and analysis of some of the problems firms face in directing and managing their new product development activities. *Prep. 15 Q.H. of Grad. Credit*

**43.935 Marketing to Low-Income Consumers**

Assigned readings, individually selected readings, and class discussions are the basis for an in-depth examination of the challenges and responsibilities which business faces in areas of the economy receiving increasing attention and concern. Marketing to low-income consumers will be studied from the point of view of both consumers or buyers and the marketing or business firms with whom they deal. Emphasis on readings and discussions will reflect the needs and interests of the class. *Prep. 43.812, Marketing Management II*

**43.936 Strategy Problems of Mass Distributors**

An examination of selected major strategy problems facing large-scale food and general merchandise distributors: selecting store location, determining merchandising and promotional policies, and formulating long-range plans. Cases and issues are explored from the viewpoint of the management of prominent supermarket, department store, and discount retailers, with some attention to wholesalers. The course is designed primarily for students contemplating careers in retailing or wholesaling, but it is also of interest to those concerned with the role of mass distributors in the marketing of consumer goods. *Prep. 43.812, Marketing Management II*

**43.941 Industrial Marketing**

The problems of industrial concerns in selling their products and services to other industrial customers are studied, first at the salesman's level, then at the area manager's level, and finally at the level of the company sales executive. Emphasis is placed on determining the customer's needs and finding ways to meet these needs. Areas covered include the role of the purchasing agent, and the problems of the supervisor and the industrial salesman. *Prep. 43.812, Marketing Management II*

**44.811 Financial Management I**

The broad economic environment in which the business firm operates, including activities related to savings and investments and the creation, pricing, and flow of profits in the national economy, is examined. Next, the major financial characteristics of business enterprises pertaining to their ability to earn profits and their capital costs are conceptually investigated. Finally, the strategies and techniques for managing the financial functions of the firm are practiced, with stress upon the factor of risk in financial analysis and decision-making. *Prep. 41.813, Planning, Decisions and Control Systems*

**44.812 Financial Management II**

Finance in relation to other business management functions is emphasized. Advanced techniques of financial analysis and decision-making, including unresolved areas of financial theory and practice, are investigated and tested against business case situations. Evening students are required to prepare a term report based on data gathered on their jobs and/or from financial literature, which demonstrates thorough understanding of the financial aspects of a single management problem. *Prep. 44.811, Financial Management I*

**44.814 International Financial Management**

Comprehensive coverage of the field of international financial management; including the fundamental problems of financial forecasting, multinational capital budgeting, affiliate financial structures, international fund movements and instruments of international finance, import-export financing, and the adversities of foreign environments. Background information is sought in the interpretation of U.S. foreign investment controls and the reaction of foreign governments to U.S. interference. *Prep. 44.812, Financial Management II*

**44.901 Finance III — Advanced Financial Management**

An opportunity to study several important areas of financial management in greater depth than was possible in the basic finance courses. Some of the topics are corporate capital structure, dividend policy, capital budgeting, and the management of current assets. Instruction is primarily through assigned readings and classroom case discussions. *Prep. 44.812, Financial Management II*

**44.921 Investment Analysis**

Investment principles and risks. The objective will be the development of a sound investment program with attention being given to identification of investment objectives and risks. Emphasis will be placed on the techniques of analysis and evaluation of various types of securities and the associated risks, the operation of the securities markets, and the various methods of portfolio management. *Prep. 15 Q.H. of Grad. Credit*

**44.923 Seminar in Strategies for Growth Funding**

A course with a narrowed scope dealing in depth with concepts and practices of designing capital structures to accommodate corporate growth. The planning and implementation of funding actions are becoming as complex and as necessary to corporate success as the conception, engineering, and production of quality products. Published and unpublished research material will be utilized



along with classroom discussions of published cases and of "live cases" presentations by visiting practitioners. The purpose of the course is to increase the understanding of management's opportunities to influence the supply of financial resources available. *Prep. 44.812, Financial Management II*

#### **44.924 Mergers and Acquisitions**

This seminar will explore the economic environment which has recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations. The financial, managerial, accounting, and legal factors affecting mergers will be studied. Students will be taught how to appraise a potential merger and to structure a merger on advantageous terms. Instruction will be through directed readings, case discussions, and independent research. While the orientation of the course will be that of the acquiring firm, the insights developed will be equally relevant to representatives of firms likely to be acquired. *Prep. 44.812, Financial Management II*

#### **44.926 Policy Issues in Corporate Money Management**

The seminar has a two-fold objective: to develop the financial manager's understanding of the basic concepts, instruments, and structure of the money market, and to analyze and discuss policy issues in corporate money management as they are affected by subtle but important changes in the environment of federal monetary and fiscal policy. *Prep. 15 Q.H. of Grad. Credit*

#### **45.805 Operations Management I**

The study of operations as an integrated system responding to the firm's goals and objectives. Explores from a manager's viewpoint (1) the nature of the short- and long-range problems generated within operations; (2) the factors in plant layout and the firm's physical facilities; and (3) the cost-data required for decisions about the productive process, including capital costs and investment criteria. Topics covered include: management's function in operations-system design, process planning, automation, work methods, job structure, job enlargement, and participation. Text and cases are used. *Prep. 49.903, Introduction to Operations Research*

#### **45.806 Operations Management II**

Continuation of the study of management of operations, exploring (1) the utility of standards and work measurement; (2) usefulness of operations control of various analytical techniques, such as waiting line theory, simulation and linear programming; and (3) the operation and control of the productive system. Topics covered include: management of inventory control, production-inventory systems, maintenance, quality, and improvement of operations cost. Text and cases are used. *Prep. 45.805*

#### **45.808 Comparative Management**

How organization structure and management processes are shaped by the mission and objectives of the organization. Examination of different types of organizations — various types of profit-oriented business organizations, public corporations, governmental agencies, unions, schools and universities, research laboratories, police and military organizations, hospitals, trade associations, and voluntary organizations. *Prep. 15 Q.H. of Grad. Credit*



**45.815 Behavioral Concepts**

A brief examination of major concepts and findings of the behavioral sciences which have particular relevance to business and administration. Systematic ways of understanding behavior will be developed, taking account of both technical and human factors involved. Individual development will be studied from the standpoint of character, perception and learning, and motivation. Behavior of people in small groups will be examined in terms of the structure and dynamics of the group itself and of the individuals to the group. *Prep. None*

**45.816 Organizational Behavior I**

Basic findings and concepts of the behavioral sciences will be related to the specific aspects of behavior in formally constituted organizations. Supervisory behavior will be examined in the behavioral context. Relations between groups will be examined with the objective of developing ways to achieve collaboration. Finally, the study of behavior in organizations will be expanded to larger organizations in order to understand and deal systematically with the complex relationships found at this level. *Prep. 45.815, Behavioral Concepts*

**45.817 Organizational Behavior II**

This final course of the required three-course sequence in behavioral science will provide an opportunity to apply knowledge about people in organizations to the improvement of organizational systems and to the process of achieving changes in organizations. The course will emphasize the skill of the student in relating behavior concepts and knowledge to the change process. *Prep. 45.816*

**45.819 Interpersonal Behavior**

Person-to-person communication and growth in interpersonal competence. The course is concerned with analysis of problems of individual action, the acquisition of action-taking skills in face-to-face situations. The focus will be upon understanding the other person and an effective expression of one's self in business and other contexts. *Prep. 45.817, Organizational Behavior II*

**45.820 Psychological Dynamics of Leadership**

Reviews the existing theories and underlying hypotheses about the basis of leadership. Examines psychoanalytic theory as a foundation from which to understand leadership behavior. An extensive case history provides material for class discussion and illustration of the theories of leadership. *Prep. 15 Q.H. of Grad. Credit*

**45.825 Business Policy I**

An understanding of corporate strategy and its elements, including an analysis of the company, its resources and opportunities, its environment, and its decision-makers. This first course in policy will be concerned primarily with the process of analyzing an overall company situation, with emphasis on internal resources and external opportunities. *Prep. all other required courses*

**45.826 Business Policy II**

A continuation of Business Policy I, with further emphasis on objectives, both corporate and personal, as major elements of corporate strategy. More emphasis on decision-making and implementation of strategy, building upon analytical work of Policy I. *Prep. 45.825, Business Policy I*

**45.828 Seminar in Growth Strategies for Corporate Management**

An opportunity for in-depth research and analysis of growth strategies available to business firms. In a seminar setting, students will examine firms and industry approaches to growth through expansion and diversification. Special emphasis will be placed on the use of research and acquisition as means for achieving growth objectives. *Prep. 45.825, Business Policy I; also, permission of the instructor.*

**45.830 Formal Planning Systems**

While planning would seem to be essential to the success of any organization, formal planning as a distinct, organized process is a remarkably recent development. As recently as 10 years ago, only a handful of firms engaged in a formal, disciplined planning process. Today, plans that extend five or more years into the future are no novelty, but the formal planning concept itself is still in its infancy. This course will focus on the present-day "state-of-the-art" in planning for both profit and nonprofit organizations. Special emphasis will be given to case studies of successful planning in real-life organizations of various sizes. Students will be expected to develop hypothetical plans based upon their own assessment of economic and other environmental factors. *Prep. 15 Q.H. of Grad. Credit*

**45.902 Planning and Control of Manufacturing Operations**

This course is concerned with the problems of managing the flow of materials, operations, and information within an organization in response to, or anticipation of, market demands. The concepts and techniques discussed are applicable in a variety of institutional settings. Topics covered include inventory management, demand forecasting, manpower and operations scheduling, project management, and integrated operations control systems. The tone of the course is pragmatic; particular emphasis is given to practical evaluation and problems of implementing the analytic methods discussed. *Prep. 45.806, Operations Management II*

**45.951 Executive Development**

The executive and the organizational and personal situation in which he must be equipped to function. Theory of leadership, experiment in established development techniques, practice in individual and group improvement methods. Management by objectives, group dynamics, case, incident, and conference method are reviewed. Coaching performance appraisal, interviewing, reading, listening, and report writing are analyzed as essentials of executive development and achievement. *Prep. 15 Q.H. of Grad. Credit*

**45.960 Organizational Theory in Industrial Practice**

An analysis of the statics and dynamics of organization structure and behavior. Beginning with a study of such organization concepts as hierarchy, specialization, and authority, the course proceeds to examine a variety of external and internal forces which impinge on organization, frequently demanding change in organization itself. Indeed, a measure of organizational effectiveness may well be its alertness in responding to the requirements and opportunities in its external environment and, at the same time, maintaining an organization climate which is sensitive to the internal demands placed upon it.

Within this broad conceptual scheme and using selected readings, company histories, and case analyses, the following kinds of questions will be explored: What external and internal forces may demand change in organizations? What is the nature of these forces for change? Do they conflict or mutually reinforce one another? How is the need for change recognized and translated into new organizational forms? *Prep. 41.811, Basics of Financial and Managerial Analysis*

#### **45.961 Business Participation in Metropolitan Problems**

Activities of business as a participant in urban and area resource development — human, physical, cultural. Business leadership and policy in sustaining a viable social, political, and economic order with consideration of complications, perplexities, programs, and alternatives. *Prep. 15 Q.H. of Grad. Credit*

#### **45.962 Institutional Environment of Business I**

The relationship of the business corporation to various elements in its environment: political, social, economic, scientific, and educational. Developing interactions and mutual responsibilities, with emphasis on initiating and planning to affect these external institutional relations rather than only to react. Responsibilities of business and of businessmen. *Prep. 15 Q.H. of Grad. Credit*

#### **45.964 Institutional Environment of Business II**

Further examination of the relations of business with its environmental influence; the responsibilities of the businessman and the firm to external and internal interests in a dynamic and pluralistic system. Emphasis on situations involving conflicting values and personal, organizational, moral, and public interest, with role-playing to allow student participation in corporate conflict determination. *Prep. 45.962, Institutional Environment of Business I*

#### **45.965 Management of Small Business Enterprises**

Problems in various phases of the management of a new small business. An appraisal of risk as well as reward is made for business opportunities. Problems range from locating, evaluating, and financing a small business to those of survival and growth in a going concern. *Prep. 15 Q.H. of Grad. Credit*

#### **45.968 Management of New Enterprises**

Oriented basically toward the entrepreneur. Consideration of locating and evaluating business opportunities, inventions, licensing, patents, etc. Organizing a new business, raising capital, and state regulations. Acquiring a going concern. *Prep. 15 Q.H. of Grad. Credit*

#### **45.969 Government and Business**

The expanding scope of the government's economic and socioeconomic activities is bringing about a much closer relationship between government and business. The course analyzes the role of government as a regulating force, as well as the nature and impact of government fiscal economic and socioeconomic policies upon the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public-utility, antitrust, labor, and socioeconomic legislation. *Prep. 15 Q.H. of Grad. Credit*

**45.971 Personnel Management**

Significant developments of industrial relations and employment theory; the principles of personnel management and of management-union relations; policy considerations for the managing of manpower resources; policy impact of current developments in work theory; and managing resources. *Prep. 15 Q.H. of Grad. Credit*

**45.972 Industrial Relations**

Labor policy in relation to management, unions and the public; management-union relations as joint control over human resources of organizations, private and public; the labor movement and collective bargaining; work rules and productivity; labor disputes and supplements to negotiations; political and economic power; legal responsibilities of labor and management; management authority, employee discipline; types of management-union relations. Theories and cases. *Prep. 45.971, Personnel Management*

**45.985 Management of Research and Development**

Some corporations grow more rapidly than their competitors. This is due, for the most part, to better management of their technical programs. This course focuses on the unique problems of R & D management through readings and case studies which bring out the important considerations involved in (1) dealing with scientists and engineers as individuals; (2) planning, organizing, and controlling research; (3) staffing and compensating scientists; and (4) establishing a climate for research. *Prep. 41.811, Basics of Financial and Managerial Analysis*

**45.989 Science and Technology: The Challenge to Management**

This course provides a greater understanding of the growing importance of the results of science and technology on business activity and of the special problems and opportunities encountered by management in making use of this knowledge. The course examines the complex interaction of social, economic, political, and technical variables which determine the climate for technological change. The critical role of the manager in the innovative process is studied, looking at the great array of techniques which help him keep abreast of new R & D results. The contribution of various organizational structures to the creative application of technology is also examined. *Prep. 15 Q.H. of Grad. Credit*

**45.991 Business Law—Law of Contracts, Agency and Sales**

Designed to give the student a basic knowledge of the legal aspects of contracts and the results of contractual obligations. Attention is given to the employment contract in general, with emphasis on the principle and agent and master and servant relationships. The law governing the sale of personal property as reflected in the Uniform Commercial Code is emphasized. *Prep. 15 Q.H. of Grad. Credit*

**45.992 The Law of Business Organizations and Negotiable Instruments**

The Law of Negotiable Instruments as reflected in the Uniform Commercial Code, with special consideration given to commercial paper used in business

transactions. The law governing formation and operation of partnerships, corporations, and other business organizations, with emphasis on the legal results and operations of those concerned and the liability of members thereof. A study of the legal framework within which the formal business organization must operate. *Prep. 15 Q.H. of Grad. Credit*

#### **45.996 Management Intern Seminar**

Special assistance to Management interns in the research and writing of their intern report. *Prep. None*

#### **45.999 Special Studies in Business Administration**

This course provides for a special tutorial arrangement between a student and a faculty member for a guided reading, research, laboratory, field work, report, or teaching experience. It is for graduate students who desire to do advanced work or carry out some special investigation of a problem in business administration not specifically covered elsewhere in the curriculum. Students must petition the Committee on Graduate Study in Business Administration for permission to register in this course. This petition should include an outline, a brief description of the work planned, and an indication of the professor to whom the student will be responsible. The professor will submit to the Graduate Office a letter outlining in some detail the nature of the work that the student will be doing in the course. The petition will be submitted after the student has received permission to take the course from a member of the College of Business Administration faculty. The course carries variable credit, ranging from one to three quarter hours. *Prep. 15 Q.H. of Grad. Credit*

#### **48.801 Seminar in Transportation Systems**

The objectives are twofold: (1) to provide a basic understanding of the functions and importance of the domestic transportation system, and (2) to develop the student's ability to analyze and critique government policies related to transportation. The cost, service, and pricing characteristics of the several modes of transportation are examined. Emphasis is given to the special problems which confront both carriers engaged in the various forms of transportation and shippers who rely upon their services. *Prep. 15 Q.H. of Grad. Credit*

#### **48.901 Business Logistics**

This course studies the design and management of physical distribution systems to facilitate the flow of goods through distribution channels. It covers aspects of plant and warehouse locations, inventory controls and selection of transportation carrier. The case includes the use of case problems in logistics. *Prep. 15 Q.H. of Grad. Credit*

#### **49.901 Managerial Economic Analysis**

Managerial economic analysis establishes the economic foundation and framework within which specific quantitative tools designed to facilitate decision-making will be developed. Topics include an evaluation of the profit maximization criterion, the Marginalist Concept, relevant costs, cost analysis and pricing policies, forecasting, multiple regression and correlation analysis, market structure, and market behavior. *Prep. 49.902, Statistical Analysis and Inference*

**49.902 Statistical Analysis and Inference**

An introduction to methods of statistical analysis and inference. Topics include probability theory, discrete and continuous probability distributions, sampling distributions, estimation, tests of hypotheses, Bayesian analysis, use of sample information, and simple regression and correlation analysis. *Prep. None*

**49.903 Introduction to Operations Research**

Introduction to the tools of operations research with emphasis on their application to problem-solving in the functional areas of business. Topics covered include linear programming, sensitivity analysis, duality network analysis, dynamic programming, integer programming, and simulation. *Prep. 49.901, Managerial Economic Analysis*

**49.918 Information Theory and Systems**

The objective of this course is to develop a framework for the analysis of communication and information systems in organizations. Aspects of communications theory are studied as background for building this framework. Through the analysis of case studies, the adequacy of the analytic framework and its underlying theory are tested.

Topics will include development of a framework for analysis for viewing information systems and communication in organizations. Various aspects of communications theory will be discussed and analyzed. A major objective of the communications and informations flow in organizations is to tie these events back to the underlying theory. *Prep. 15 Q.H. of Grad. Credit*

**49.919 Economic Behavioral and Environmental Determinants of Demand**

An examination of the various external forces—economic, behavioral, social, technological, competitive, political—which create and shape demand for goods and services. Research techniques useful in measuring and predicting demand are considered. Cases are utilized to allow students to analyze, from the point of view of a particular firm or industry, the effects of external forces on the demand for their products, and also to consider the actions that might be taken by a firm or industry to influence demand. Supplementary readings are used to provide concepts, techniques, and knowledge useful in understanding the dynamics of demand. *Prep. None*

**49.922 Marketing Information Systems**

This seminar examines the theoretical concepts, empirical research, and practical applications of information systems in marketing. A few lectures are given on basic concepts. Individual studies are prepared by the members of the seminar on subsystems such as forecasting, sales control, input-output analysis, consumer models, and the concept of total systems. These studies are followed by oral reports and group discussions. *Prep. 15 Q.H. of Grad. Credit*

**49.925 Principles and Methods of Business Research**

A major objective is to present business research from an operational approach, applying the logic of the research procedure to the investigation and solution of business problems. Methodology is studied, discussed, and implemented in detail and from an overall conceptual point of view.



Writing techniques, statistical techniques, report format, and the like are discussed, and a report is generally required. *Prep. 15 Q.H. of Grad. Credit*

#### **49.932 The Computer and Its Applications I**

The development of familiarity with the computer and an understanding of its increasingly vital role in solving management problems. Introduction to the computer: hardware, software, and basic concepts of operation. The student is introduced to programming by a class problem involving the flow charting and coding of a typical business application. Lectures are primarily divided into two parts: (1) fundamentals and principles of electronic data processing, and (2) management and systems considerations in determining the feasibility of computer applications. The course provides a basic business overview of the fast-growing computer field and prepares the student for more specialized computer study. *Prep. 15 Q.H. of Grad. Credit*

#### **49.933 The Computer and Its Applications II**

The student is assumed to have a basic knowledge of computers as acquired in The Computer and Its Applications I or the equivalent. A class problem involving the design of a business application for computer processing will introduce the student to the systems trade-offs and general business considerations that accompany computerization. Advanced management science and communications applications will be explored, with emphasis on specific case studies. Finally, the student will be introduced to management considerations in the use of computers by reading the Harvard Business Review series on Management Information. Topics such as the place of electronic data processing in organization, the impact of computers on management, and the role of management in obtaining maximum benefit from EDP will be explained thoroughly. The course views computerization from the vantagepoint of the business manager, not the technician. *Prep. 49.932, The Computer and Its Applications I*

#### **49.935 Computer Applications in Management Science**

Reviews techniques of quantitative economic decision-making which use computers and emphasizes practical problems of preparing or selecting computer programs, relating techniques to realistic problems of data, and evaluating the costs and effectiveness of implementation. Techniques covered include Monte Carlo simulation, linear programming, multiple regression, capital investment risk analysis, and statistical analysis. Students will use computer time-sharing systems to learn FORTRAN, write simple programs, and use library routines. *Prep. 15 Q.H. of Grad. Credit*

NOTE: There is a special charge of up to \$45 for this course for commercial time-sharing computer use and the text materials.

#### **49.952 Seminar in Capital Budgeting**

A course with a narrow scope, dealing in depth with the managerial and financial problems concerning the allocation of corporate resources to long-term uses within the firm. The problems to be considered include the encouragement of the development of investment opportunities, as well as systems and techniques for their evaluation and selection. The goal of the course is to enhance the individual's ability to affect the selection of investment opportunities in a way which will make a maximum contribution to the development of the firm. *Prep. 15 Q.H. of Grad. Credit*





# undergraduate universities attended by students entering in 1971

*Adelphi University*  
*Air Force Academy*  
*Akron University*  
*Allegheny College*  
*Alma College*  
*Amherst College*  
*Arizona, University of*  
*Assumption College*  
*Atlantic Union College*  
*Bates College*  
*Bellevue College*  
*Bentley College*  
*Boston College*  
*Boston University*  
*Bowdoin College*  
*Brandeis University*  
*Bridgeport, University of*  
*Brooklyn Polytechnic Institute*  
*Brown University*  
*Bryant College*  
*Bucknell University*  
*Calcutta, University of (India)*  
*California, State Polytechnic College*  
*California, University of*  
*Calvin College*  
*Canisius College*  
*Case Institute of Technology*  
*Catholic University of America*  
*Catholic University (Venezuela)*  
*Cheney State College*  
*Cincinnati, University of*  
*City College of New York*  
*Colby College*  
*Colgate University*  
*Columbia University*  
*Connecticut, University of*  
*Cooper Union of New York*  
*Cornell University*  
*Dartmouth College*  
*Delaware, University of*  
*Denison University*  
*Drake University*  
*Drexel University*  
*Duke University*  
*Eastern College of Montana*  
*Fairfield University*  
*Florida, University of*  
*Fordham University*  
*Franklin and Marshall College*  
*Gannon College*

*Georgia Institute of Technology*  
*Gettysburg College*  
*Hartford University*  
*Harvard University*  
*Hawaii, University of*  
*Hebrew University of Jerusalem*  
*Hiram College*  
*Hofstra University*  
*Holy Cross College*  
*Hogers Technica School (Netherlands)*  
*Houston, University of*  
*Illinois, University of*  
*Immaculata College*  
*Institute of Science (India)*  
*Ithaca College*  
*Johns Hopkins University*  
*Keene State College*  
*Lafayette College*  
*Lake Forest College*  
*Lakeland College*  
*Lehigh University*  
*Lincoln University*  
*Lowell Technical Institute*  
*Loyola University*  
*Maine, University of*  
*Maryland, University of*  
*Massachusetts Institute of Technology*  
*Massachusetts Maritime Academy*  
*Massachusetts, University of*  
*McGill University (Canada)*  
*McMaster University (Canada)*  
*Merrimack College*  
*Nasson College*  
*Nebraska, University of*  
*New Hampshire, University of*  
*Northeastern University*  
*Northern Polytechnic (England)*  
*Notre Dame, University of*  
*Ohio State College*  
*Ohio Wesleyan University*  
*Pennsylvania State University*  
*Pennsylvania, University of*  
*Plymouth State College*  
*Polytechnic Institute of Brooklyn*  
*Pratt Institute*  
*Providence College*  
*Radcliffe College*  
*Rensselaer Polytechnic Institute*  
*Rhode Island, University of*  
*Rochester Institute of Technology*

Rochester, University of  
 Rutgers, The State University (New Jersey)  
 St. Anselm's College  
 St. John University  
 St. Lawrence University  
 San Jose State College  
 Santo Thomas, University of  
 Scranton, University of  
 Simmons College  
 Siriba College (Kenya)  
 Smith College  
 Stanford University  
 State College at Boston  
 State University of New York, at Buffalo  
 State University of New York, at Genesco  
 State University of New York, at Oneonta  
 Stevens Institute of Technology

Stonehill College  
 Suffolk University  
 Sydenham College (India)  
 Syracuse University  
 Tennessee, University of  
 Texas, University of  
 Tufts University  
 United States Merchant Marine Academy  
 United States Military Academy  
 United States Naval Academy  
 Vermont, University of  
 Villanova University  
 Virginia Polytechnic Institute  
 West London College of Commerce (England)  
 Worcester Polytechnic Institute  
 Yale University



# faculty directory

Name	Room	Ext.
Abbanat, Robert	204 HA	3236
Ammer, Dean S.	213 HA	3252
Andersen, Anker V.	225 HA	3270
Anderson, Harley H.	202 HA	3230
Anderson, Thomas C.	305 HA	3257
Borack, Jules I.	218 HA	3255
Briggs, Warren G.	218 HA	3255
Brimm, Michael		495-6663
Caplan, Robert H.	225 HA	3220
Carter, Clairmont P.	205 HA	3240
Cerullo, Saverio	209 HA	3248
Collazo, Charles J.	322 HA	3260
Cossaboom, Roger A.	210 HA	3264
Croke, Paul V.	213 HA	3252
Cromwell, Gerald	309 UR	2874
Crotty, Philip T.	212 HA	3272
Curran, Joseph R.	205 HA	3240
Dufton, Charles H.	322 HA	3260
Farrar, Robert H.	205 HA	3240
Fiumara, Angelo	204 HA	3236
Fletcher, Harold	209 HA	3248
Golemme, Joseph M.	206 HA	3244
Grossman, Steven	205 HA	3240
Gruber, William H.	213 HA	3252
Gubellini, Carlo E.	204 HA	3236
Hehre, Robert J.	222 HA	3248
Hekimian, James S.	202 HA	3230
Higgins, Richard	305 HA	3257
Hobart, Christine L.	213 HA	3252
Jordan, John W.	224 HA	2714
Kaen, Frederic	209 HA	3248
Kantor, Jerome		237-4100, Ext. 3249
Keith, Lyman A.	204 HA	3236
Lans, Peter	225 HA	3270
Lieb, Robert	204 HA	3236
Lindhe, Richard	205 HA	3240
Malchman, Laurence	205 HA	3240
Macy, David		495-6523
Marple, Wesley W.	209 HA	3248
Marshall, Edward	213 HA	3252
McCarthy, Daniel J.	218 HA	3255

McDonald, Philip R.	322 HA	3260
Minichiello, Robert J.	322 HA	3260
Miranowski, John	309 UR	2874
Morrison, Richard J.	322 HA	3260
Musgrave, Peggy B.	309 UR	2874
Myers, A. Howard	305 HA	3257
O'Connell, John	225 HA	3220
Olive, Russell	218 HA	3255
Otlewski, Robert	305 HA	3257
Parsons, Robert A.	218 HA	3255
Priem, Andre P.	202 HA	3230
Richards, Paul C.	206 HA	3244
Rochwarg, Herman	305 HA	3257
Rugina, Anghel	209 HA	3248
Santos, Richard	212 HA	3272
Scioletti, Daniel	204 HA	3236
Shore, Barry	218 HA	3255
Slavin, Albert	205 HA	3240
Timmons, Jeffry A.	213 HA	3252
Veiga, John F.	305 HA	3257
Verma, Dharmendra	322 HA	3260
Walker, Arthur	305 HA	3257
Willett, Edward	209 HA	3248
Wiseman, Frederick	322 HA	3260

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northeastern university



graduate school of education  
1971-1972



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1971-1972



Northeastern University  
102 The Fenway  
Boston, Massachusetts 02115  
Tel. (617) 437-2708



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- G7
- A6
- H6
- F5
- E9
- G8
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- G6
- G5
- B5
- F4
- F7
- G10
- B6
- E4
- E4
- J3
- H3
- F9
- F3
- E7
- H9
- G5

**Building  
Designation**

- Barletta Natatorium
- Bobolph Building
- Cabot Physical Education Ctr.
- Churchill Hall
- Cushing Hall
- Dana Research Center
- Dockser Hall
- Dodge Library
- Eli Student Center and Alumni Auditorium
- Forsyth Building
- Forsyth Building Annex
- Forsyth Dental Building
- Greenleaf Building
- Hayden Hall
- Hurtig Hall (Chemistry)
- Kennedy Building
- Knowles Center (Crim. Justice)
- Knowles Center (Law)
- 11 Leon Street
- 40 Leon Street
- Mugar Life Sciences Building
- Parker Building
- Richards Hall
- Robinson Hall
- United Realty Building

- BN
- BT
- CB
- CH
- CU
- DA
- DK
- DG
- EC
- EL
- FR
- FA
- GR
- HA
- HT
- KB
- KN
- KL
- UO
- LE
- MU
- PA
- RI
- RB
- UR



## ACADEMIC CALENDAR 1971-1972

### Fall Quarter 1971

Registration period		
Burlington	Tuesday-Wednesday	Sept. 14-Sept. 15
Boston	Monday-Friday	Sept. 20-Sept. 24
Classes begin	Monday	Sept. 27
Examination period†	Monday-Saturday	Dec. 13-Dec. 18

### Winter Quarter 1971-1972

Registration period		
Burlington	Tuesday-Wednesday	Nov. 30-Dec. 1
Boston	Monday-Friday	Dec. 6-Dec. 10
Classes begin	Monday	Jan. 3
Examination period†	Monday-Saturday	Mar. 20-Mar. 25

### Spring Quarter 1972

Registration period		
Burlington	Tuesday-Wednesday	Mar. 7-Mar. 8
Boston	Monday-Friday	Mar. 13-Mar. 17
Classes begin	Monday	April 3
Last day to file commencement card for spring commencement	Monday	April 3
Last day to pay fee for spring commencement	Monday	May 1
Final grades due in Registrar's Office for June graduates taking third quarter course	Friday	June 2
Examination period†	Monday-Saturday	June 12-June 17
Spring commencement	Sunday	June 18

### Summer Quarter 1972

Registration period		
Burlington	Monday-Tuesday	June 19-June 20
Boston	Wednesday-Friday	June 21-June 23
Classes begin	Monday	June 26
Last day to file commencement card for fall commencement	Monday	July 3
Last day to pay fee for fall commencement	Tuesday	August 1
Examination period†	Wednesday-Saturday	Aug. 2-Aug. 5

†Examinations for day classes will be held in accordance with the undergraduate examination schedule.

## UNIVERSITY HOLIDAYS 1971-1972

Columbus Day	Monday	October 11
Veterans' Day	Monday	October 25
Thanksgiving Recess	Thursday-Saturday	Nov. 25-Nov. 27
Christmas Vacation	Monday-Saturday	Dec. 20-Jan. 1
Washington's Birthday	Monday	February 21
Patriots' Day	Monday	April 17
Memorial Day	Monday	May 29
Independence Day	Tuesday	July 4
Labor Day	Monday	September 4

# the governing boards and officers of the university

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\*F. Gregg Bemis  
Edward L. Bigelow  
Robert D. Black  
Gerald W. Blakeley, Jr.  
Raymond H. Blanchard  
S. Whitney Bradley  
Rexford A. Bristol  
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Martin Brown  
John L. Burns  
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\*Louis W. Cabot  
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\*Richard P. Chapman  
Theodore Chase  
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Carl W. Christiansen  
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Adrian O'Keefe

Harry Olins

George Olmsted, Jr.

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Edward S. Parsons

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Edward D. Phinney

Jerome M. Powell

Albert Pratt

George Putnam

\*Francis J. Quirico

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\*Frank L. Richardson

\*Joseph G. Riesman

R. Earl Roberson

\*Dwight P. Robinson, Jr.

Ralph B. Rogers

Leverett Saltonstall

Julius C. Santis

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Sydney Shaftman

James L. Shanahan

S. Peter Shumavon

Gifford K. Simonds, Jr.

Donald B. Sinclair

Philip A. Singleton

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**1970-1971**

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Warren Briggs, *Associate Professor of Management*

Austin W. Fisher, *Professor of Mechanical Engineering*

Bill C. Giessen, *Associate Professor of Chemistry*

Bernard M. Goodwin, *Associate Professor of Chemical Engineering*

Charles Haley, *Assistant Dean, College of Education*

Maurice Kaufman, *Associate Professor of Education*

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# the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); and the College of Criminal Justice (1967). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, the pharmaceutical sciences, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult-day courses leading to the bachelor's degree. Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the basic College faculties concerned.

## **GRADUATE AND PROFESSIONAL SCHOOLS**

The nine graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmaceutical Sciences offers the degree of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

## **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## **RESEARCH ACTIVITIES**

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# buildings and facilities

## MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

## Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

## Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and three divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, and Mathematics and Psychology. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 250,000 volumes supplemented by some 356,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 1,800 periodical titles, 90,000 documents, and 3,700 sound recordings.

### **Cabot Physical Education Center**

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

### **Apartments for Graduate Students**

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first-come, first-served basis.

## **SUBURBAN FACILITIES**

### **Suburban Campus**

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

### **Henderson House**

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.



**Marine Science Institute**

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.



# the graduate school of education

The Graduate School of Education provides programs leading to the Master of Education degree for in-service educators who wish to pursue a specialization, for individuals with no previous experience in the field of education who wish to teach on the elementary or secondary level, and for individuals who wish to pursue the special areas of study indicated below.

Individuals who possess or are eligible for teaching certificates may earn the Master of Education degree in the areas of elementary or secondary school counseling, curriculum and instruction, educational administration, reading, deaf education, teaching the emotionally disturbed, or teaching the mentally retarded.

Those individuals who do not possess a teaching certificate may specialize in the areas of college or community counseling, educational research, speech pathology or audiology, rehabilitation administration, elementary teacher preparation or secondary teacher preparation in English, mathematics, modern languages, science, or social studies.

Programs of study leading to the Certificate of Advanced Graduate Study in the areas of counseling and educational administration are offered to those individuals who presently hold a master's degree.

## **GENERAL REGULATIONS**

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

### **Registration**

Students must register within the period listed on the school calendar. Time and place of registration will be announced prior to each period.

### **Residence**

All work for advanced degrees must be completed at the University unless approval has been obtained from the Director of the Graduate School for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

### **Grading System**

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

**A Excellent**

This grade is given to those students whose performance in the course has been of very high graduate caliber.

**B Satisfactory**

This grade is given to those students whose performance in the course has been at a satisfactory level.

**C Fair**

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

**F Failure**

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

**I Incomplete**

This grade is given to those students who fail to complete the work of the course.

**S Satisfactory without quality designation.**

**U Unsatisfactory without quality designation.**

These two grade are used for the first quarter of a two-hour sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to take a final make-up examination must obtain permission of the Director of the Graduate School by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the Director to defer it to one of the next two quarters.

### **Class Hours and Credits**

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit. The academic calendar at the front of this bulletin should be consulted in order to determine the opening and closing dates of each quarter.

### **Continuity of Program**

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

### **Withdrawals**

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington campus office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

### **Changes in Requirements**

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

### **Application for the Degree**

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

### **Honor Society**

Northeastern University has on campus an active chapter of Kappa Delta Pi, a national honor society in education. Founded in 1911 at the University of Illinois, it invites individuals to become members "because of high records and an exhibited professional attitude which would enable one to grow in the field of education."

Graduate students must be degree candidates in the College of Education and have completed a major portion of work with a cumulative average of at least 3.5 out of 4.0, and have no C grades on their records.

Interested candidates may receive further information by writing: Dean of Education, Northeastern University, Boston, Massachusetts 02115.

### **Supporting Services**

The College of Education operates or coordinates with other agencies in the operation of certain bureaus, clinics, and offices which support and enrich the academic programs. Graduate students may find some of these services to be of interest and assistance while others may be

suggested as sources of information or practical experiences. Among these services are those discussed in the following paragraphs.

Northeastern University's Speech and Hearing Clinic, located in 133 Forsyth Building, provides diagnostic and therapeutic services for both University students and school-age community children insofar as staff and facilities allow. The Clinic is accredited by the Professional Services Board of the American Speech and Hearing Association.

The Instructional Materials Center (formerly the Curriculum Library), located in the Kennedy Building (104 The Fenway), contains a variety of materials and resources relating to a large number of programs and task areas of elementary and secondary schools. Use of this facility is limited to staff and students of the College of Education.

The Bureau of Educational Field Services, located in Cushing Hall (102 The Fenway), provides certain research and development as well as consultative services to school systems and other educational agencies on a contractual basis.

Northeastern University's Reading and Learning Clinic, located in Cushing Hall, provides diagnostic and corrective services in reading for both University students and school-age community children insofar as staff and facilities allow.

The New England Rehabilitation Research Institute, located in the United Realty Building, conducts rehabilitation studies on the problems of motivation and dependency and publishes reports pertaining to the area of rehabilitation. A materials resources library in rehabilitation research is housed in the same building as the Department of Rehabilitation and Special Education.

The Center for Educational Development, located in Cushing Hall, works with community agencies in developing and implementing innovative educational programs, particularly in areas which lack substantial financial resources, both urban and rural-isolated areas.

Northeastern University's Preschool Class for Mentally Retarded Children, located in the Kennedy Building, is a clinical laboratory class, supported by the State Department of Mental Health with professional support from the Department of Rehabilitation and Special Education. Graduate students gain observational and clinical experience working with this class.

In addition, the College of Education utilizes the resources, materials, and facilities of other University-wide bureaus such as the Office of Educational Resources, an important component of which is the Center for Programmed Instruction.

# financial information

## FINANCIAL OBLIGATIONS

### Tuition

Tuition for master's degree candidates, CAGS candidates and special students is \$37 per quarter hour of credit. There is a tuition charge of \$400 for Student Teaching and for the Counseling Practicum.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

### Fees

A Registration Fee of \$15 is charged all students when they register for the first time in the Graduate School at Northeastern.

Other fees include a charge of \$10 for late payment of tuition; a final examination make-up fee of \$5; a fee of \$25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of \$12.50 per quarter for the services available in the student center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue campus are charged \$ .75 a quarter.

All full-time students, including those with assistantships and fellowships, will pay a nonrefundable university health services fee of \$75 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University health service.

All financial obligations to the University must be discharged by graduation.

### Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund	
Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

## FINANCIAL AID

There is a limited number of means of providing financial aid for graduate students. Information concerning scholarships and loan programs is available in the Office of Financial Aid.

### Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching, administrative duties. In all cases the student must register for a half-time academic load.

### Tuition Assistantships

These appointments offer tuition waiver only. Graduate students given this type of appointment are assigned duties in the department requiring an average of 8 hours per week. They are expected to register for a full-time academic load.

### Teaching Assistantships

Graduate students given this type of appointment assist in the work of instructional departments or other offices of the University. The appointee may be assigned to class instruction, laboratory supervision, correcting papers and proctoring examinations. Including necessary preparation time, assigned duties require about 18 to 20 hours per week.

The student must register for a half-time academic load.

### Traineeships

Graduate students given these appointments must devote full-time to graduate work in accordance with the stipulation of the appointment. These appointments are made from traineeships available from NASA, NSF, NDEA and other government grants to the University. They may be for 9 to 12 months.



### **Martin Luther King, Jr., Scholarships**

These scholarships provide for remission of tuition and all fees and are awarded to qualified full- and part-time black students on the basis of financial need.

### **Appointments**

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

### **Dormitory Proctorships**

A number of proctorships in men's dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

### **National Defense Student Loan Program**

Under the provisions of an act of the Federal Government, students carrying an academic load of one half or more are entitled to apply for loans up to \$2500 for one school year and up to a total of \$10,000 for undergraduate and graduate work. The actual amount of any award will be determined on the basis of need and academic promise.

The repayment period begins nine months after the borrower ceases to carry a half-time load and extends ten years from that point. Cancellation of up to 50 per cent of national defense loans including interest is allowed for graduates who enter the field of teaching. Up to 100 per cent may be cancelled for service in certain areas. Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students and one month prior to the start of the quarter for which aid is requested for other students.

### **Guaranteed Student Loan**

Educational assistance loans may be available from certain banks in the student's home town. These loans, guaranteed by state agencies, carry an interest charge of seven per cent, paid by the Federal Government while the student continues his educational program. Graduate students may borrow up to \$1500 for each year of study up to a maximum of \$7500 for both undergraduate and graduate work. Monthly repayment begins nine to twelve months after completion of study and extends up to ten years.

# faculty

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# programs of the graduate school of education

## MASTER OF EDUCATION

### Professional Specializations

Counselor Education

Elementary Guidance

Secondary Guidance

College Counseling and Student Personnel

Community Counseling

Curriculum and Instruction

Educational Administration

Educational Research

Reading

Rehabilitation Administration

Special Education

Speech Pathology and Audiology

Teaching the Deaf

Teaching the Emotionally Disturbed

Teaching the Mentally Retarded

### Teacher Preparation Programs

Elementary Education

Secondary Education

English

Mathematics

Modern Languages

Science

Social Studies

## CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS)

Counselor Education

Educational Administration

## **MASTER OF EDUCATION DEGREE**

### **Admission to Degree Candidacy**

An applicant must have earned a bachelor's degree from an accredited institution and must complete all admissions procedures as described.

An applicant for graduate study in a degree program should have on file in the office of the Graduate School of Education three weeks (two months for full-time) prior to the beginning of classes in any given quarter:

1. Two completed application forms.
2. An official transcript from all colleges or universities attended.
3. References as follows:
  - a. If no teaching experience, three letters of recommendation from individuals acquainted with the applicant's scholastic, professional, or intellectual ability.
  - b. If teaching experience (beyond student teaching), one reference from the current or most recent supervisor.
4. An official copy of the Miller Analogies Test score (MAT).
5. For CAGS applicants, a record of an interview with the chairman of the department to which they are applying.
6. For applicants whose native language is not English, an official copy of the results of the Test of English as a Foreign Language (TOEFL).

The Graduate School of Education may require a preadmission conference with any applicant. Applicants may at any time request a conference with the Director of the Graduate School of Education or his designate.

### **Full-time Study**

A full-time student must take three courses in all quarters except the summer session, during which he must take a minimum of two courses. Enrollment in an additional course in any quarter must be approved by the adviser.

### **Part-time Study**

A part-time student may enroll in a maximum of two courses in any given quarter.

### **Program Selection and Registration**

Upon acceptance as a degree candidate, the student will be assigned an adviser in his major area of study. After notification of acceptance by the Graduate School of Education, the student should confer with the

adviser regarding his program of studies and initial course registration. The student's initial program and any subsequent changes may develop only as a result of the written recommendation of the adviser.

Initial registration will be allowed only upon presentation of a counter-signed "Permit to Register" card.

### **Special Student Status**

Applicants who acknowledge that they do not wish to pursue a degree may be accepted as special students. Special students are allowed to register for a maximum of three courses, one per quarter, provided that they submit an application form and an official transcript three weeks prior to the beginning of classes. Academic credit earned in such study may not be used to fulfill degree requirements in the Graduate School of Education unless the applicant is accepted as a degree candidate and the courses are applicable to his program. Special students may be considered for degree candidacy only upon full presentation of application materials and a formal petition to the Director of the Graduate School of Education.

### **Academic Classification**

1. *Regular* Applicants who meet in full the criteria for immediate matriculation are classified as regular students.
2. *Provisional* Some applicants who do not meet regular admissions standards may be admitted as provisional students. Such students must maintain a B average in their first twelve quarter hours of work in order to continue in the graduate program. Provisional students admitted for part-time study may take only one course in their first quarter of study.
3. *Special* See above.

### **Programs of Study**

The curricula of the programs for the Master of Education degree are given on pages 38–51.

Programs are available for students with or without regular teaching certification. Those with certification may major in the professional specializations listed on page 37.

Students without certification must pursue either a Master of Education degree program for which certification is not mandatory (as indicated on page 37) or a degree program which includes supervised student teaching. At Northeastern University, state certification and professional requirements are satisfied only as part of teacher preparation

degree programs (as described on pages 50–51) at the elementary level and in the following subject areas at the secondary level: English, Mathematics, Modern Languages, Science, and Social Studies.

### **Comprehensive Examination**

The requirement for a comprehensive examination will be indicated to the student by the adviser.

### **Academic Requirements**

In order to qualify for the Master's Degree in Education, an average grade of B must be obtained in the degree credit courses. No additional course credits may be allowed in order to satisfy the B average required for the degree.

No student who receives a grade of less than B in three or more degree credit courses will be permitted to continue in the program.

### **Credit and Course Requirements**

In satisfying the requirement for a minimum of 40 quarter hours, a student's program must include at least 12 courses which apply to the degree.

### **Transfer Credits**

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits are recommended for transfer by the student's adviser, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at an accredited institution, and have not been used toward any other degree. Students should petition the Director of the Graduate School in writing for all transfer credit by completing the necessary form, obtainable from either the office of Graduate School of Education or the faculty adviser. This form should be submitted to the appropriate person along with an official transcript and a course description. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

### **Time Limitations**

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the respective graduate school committee.



### **CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS) PROGRAM**

An applicant for the Certificate of Advanced Graduate Study in Counselor Education or Educational Administration must hold a master's degree from an accredited institution and file supportive materials in accordance with guidelines which will be provided upon request. Inquiry, specifying the program for which information is sought, should be addressed to the Director of the Graduate School of Education.

Counselor Education CAGS students are accepted once a year, between April 1 and November 1. All application materials must be completed by September 15, or the candidate's application will automatically be forwarded for inclusion in the next action period. Within this period candidates will be informed of their admission status as soon as possible after all application credentials are completed, but no later than the start of the registration period for the next quarter.



# fields of study

## PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

### Master of Education

Applicants who possess a valid teaching certificate or who are eligible for such certificate at the time the program is begun, may be admitted to the study for the Master of Education degree and specialize in one of the following areas:

	Page
Counselor Education	39
Elementary Guidance	39
Secondary Guidance	40
*College Counseling and Student Personnel	40
*Community Counseling	41
Curriculum and Instruction	42
Educational Administration	42
*Educational Research	43
Reading	45
*Rehabilitation Administration	45
Special Education	45
*Speech Pathology and Audiology	46
Teaching the Deaf	48
Teaching the Emotionally Disturbed	48
Teaching the Mentally Retarded	49

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

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\*Teaching certification not mandatory.

**MASTER OF EDUCATION  
CORE REQUIREMENT**

**Required of all candidates:**

*Area I — Research*

50.815 Research Design in Education

Entrance into this course must be preceded by satisfactory completion of a proficiency examination in statistics administered by the Center for Programmed Instruction or by satisfactory completion of 50.841 Introduction to Educational Statistics.

This course must be taken as one of the first six courses by all students who entered a degree program in September, 1970, and thereafter.

**All candidates must complete at least one course in each of two of the following areas:**

*Area II — Psychological Foundations*

50.806 Psychology of Learning

50.810 Psychology of Personality

50.811 Psychology of Cognition

It is strongly recommended that entrance into any of these courses be preceded by a course in psychology.

50.808 Seminar in Child Development

Entrance into this course *must* be preceded by a course in Child Psychology or Human Development.

50.809 Seminar in Adolescent Development

Entrance into this course *must* be preceded by a course in Adolescent Psychology or Human Development.

*Area III — Social Foundations*

50.802 Sociology of Education

50.805 Personality and Social Structure

It is strongly recommended that entrance into either of these courses be preceded by a course in Sociology, Cultural Anthropology, or Social Psychology.

50.820 Seminar in Contemporary Issues in American Education

*Area IV — Humanistic Foundations*

50.812 History of Education

50.813 Philosophy of Education

50.818 Comparative Education

## PROGRAMS

### Counselor Education

The Counselor Education Department offers four distinct programs, each of which is oriented around a common core preparation in counseling. Students must elect one of these specific programs. The master's degree requirements can be completed in the equivalent of one year. However, the department considers these programs to be minimal and urges most students to consider an additional year of study leading to the C.A.G.S. The programs are described on the following pages.

Part-time students entering any of the programs should be aware that 53.803, 53.804 and 53.805, 53.806 are only offered on a sequential basis beginning in the Fall Quarter. They must be taken concurrently and for part-time students no earlier than the second year of part-time study.

Full-time students in Counselor Education Programs will be accepted once a year between April 1 and July 15, with a deadline of July 1 for completion of all admissions requirements. Early application is encouraged since there is limited full-time enrollment and all spaces may be taken before the July 1 deadline for filing application materials. Part-time students will be admitted between April 1 and November 1, with the deadline for completing admissions requirements September 15.

The Department of Counselor Education offers a paid internship-in-counseling program to full-time students who can begin their programs in the summer session. All full-time applicants are urged to apply for this program as preference will be given to qualified students who will accept internships and begin their programs in the summer. Actual internship placements begin in September and extend to the following June. For further information and application forms for the internship, write directly to the Department of Counselor Education.

### *Elementary Guidance*

Students electing this program must be eligible for or possess a valid teaching certificate, preferably at the elementary level. The elementary school counselor performs three major functions in the elementary school: 1) counseling with pupils, 2) consulting with teachers, administrators, and parents, and 3) coordinating other pupil services for the benefit of pupils.

The program is as follows:

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

### Counselor Education Requirements

- 53.800 Foundations of Guidance and Human Services
- 53.801 Tests and Test Procedures
- 53.810 Vocational and Personal Development in the Elementary School
- 53.803, 53.804 Counseling Theory and Process I and II
- 53.805, 53.806 Elementary Guidance Practicum

Two electives from among the following recommended courses:

- 53.808 Group Counseling
- 53.811 Family and Parent Counseling
- 53.824 Wechsler Scales
- 55.807 Learning Disabilities
- 55.830 Etiology, Dynamics and Treatment of Emotional Disturbances in Children

### *Secondary Guidance*

Students electing this program must be eligible for or possess a valid teaching certificate, preferably at the secondary level. The secondary school counselor is also a consultant and coordinator of services. However, there is more emphasis at this level on counseling for career development, especially educational and vocational decision making. In the consultant role, the secondary counselor becomes more actively involved in the community and in the curricula and instructional aspects of the school.

The program is as follows:

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

### Counselor Education Requirements

- 53.800 Foundations of Guidance and Human Services
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803, 53.804 Counseling Theory and Process I and II
- 53.805, 53.806 Secondary Guidance Practicum
- 53.808 Group Counseling

One elective from among the following recommended courses:

- 53.807 Administration of Guidance Services
- 53.811 Family and Parent Counseling
- 53.824 Wechsler Scales

### *College Counseling and Student Personnel*

This program is designed for students who want to work in higher education at some level. The preparation is based on the assumption

that every student personnel worker must have the human relations skills of the counselor. Around this core preparation in counseling, the student is helped to develop important concepts relating to the field of student personnel work in higher education. Students may continue for further graduate study either in the field of counseling psychology or in student personnel on the basis of this program. Entry positions for graduates include counseling in junior colleges or colleges (where experience is usually required, however), residence hall counselors, financial aid, student activities, assistants to deans of men and women, and admissions counseling.

The program is as follows:

Master of Education Core (required of all candidates).

Three courses as defined on page 38.

#### Counselor Education Requirements

- 53.800 Foundations of Guidance and Human Services
- 53.801 Tests and Test Procedures
- 53.809 The College Student and His Campus
- 53.803, 53.804 Counseling Theory and Process I and II
- 53.805, 53.806 College Counseling and/or Student Personnel Practicum

Two electives from among the following recommended courses:

- 53.802 Vocational Development and Occupational Information
- 53.808 Group Counseling
- 53.812 Seminar in Student Personnel Work
- 51.900 Cooperative Education in American Higher Education

#### *Community Counseling*

Students who prefer to work in settings other than educational institutions will find this a preferred major. Some of the possible employment settings for graduates of this program are the following: Division of Employment Security, community mental health agencies, correctional institutions, local and Federal governmental agencies providing helping services to youth, and rehabilitation counseling agencies. Some of the types of helping services for which this program can prepare students are the following: employment counseling, rehabilitation counseling (physically, mentally, and emotionally handicapped), correctional counseling (delinquency prevention), vocational rehabilitation, preventive mental health counseling, and family counseling.

Any preparation program for the broad range of helping positions listed above must be necessarily broad at the master's level with limited opportunity for initial specialization. The second year of study (CAGS) is considered essential for all qualified students who desire a career in most aspects of community counseling.

The program is as follows:

Master of Education Core (required of all candidates).

Three courses as defined on page 38.

Counselor Education Requirements

53.800 Foundations of Guidance and Human Services

53.801 Tests and Test Procedures

53.803, 53.804 Counseling Theory and Process I and II

53.805, 53.806 Community Counseling Practicum

Three electives from among the following recommended courses:

50.950 Introduction to Rehabilitation

50.951 Principles of Medical Rehabilitation

50.952 Vocational Rehabilitation and Social Services

50.956 Community Planning in Rehabilitation

50.965 Occupational Placement

53.802 Vocational Development and Occupational Information

53.808 Group Counseling

53.811 Family and Parent Counseling

## **Curriculum and Instruction**

This concentration is appropriate for experienced teachers at all levels who wish to improve their teaching skills and knowledge of subject matter. This concentration is also appropriate for those wishing to prepare themselves for possible supervisory responsibility in specific areas. The fields in which a student may specialize are the following: English, Language Arts, Mathematics, Science, and Social Studies.

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

Three courses in Curriculum and Instruction numbered 51.800-51.899 (except 51.805).

Three courses in subject matter appropriate to the student's teaching interests.

Three electives in education or subject matter.

Each student's program must be approved by his faculty adviser before he enrolls in any courses.

## **Educational Administration**

The Master's Degree program in Educational Administration is based on the premise that there are certain competencies and understandings basic to effective administrative behavior. These generally accepted principles should be examined by each student initially entering a program of educational administration regardless of his projected professional goals. Our feeling that practical experience should be based on theoretical considerations has led us to place heavy emphasis on the

use of a variety of simulated school system environments. Many of the courses use the "simulated materials approach" to provide students with the opportunity for developing competence in administrative decision-making in a way that very closely approximates reality. Completion of this program is designed to prepare the student for initial entry into the field of educational administration, preparing him for such beginning positions as: assistant principal, principal of a small school, department chairman, special program director, beginning administrator in adult and higher education; or it may serve as a foundation for further graduate study.

**Master of Education Core (required of all candidates)**

Three courses as defined on page 38.

**Educational Administration Requirements**

52.810 Leadership in Education: Part I

52.811 Leadership in Education: Part II

**Departmental Program of Study**

52.812 Overview of Administrative Tasks

52.813 Instructional Leadership: Curriculum Development and Supervision

52.805 Simulated Problems: Secondary School Administration  
or

52.814 Simulated Problems: Elementary School Administration

52.806 Directed Field Experiences in School Administration I

52.807 Directed Field Experiences in School Administration II

52.808 Seminar in Educational Administration

Elective (to be approved by adviser)

A specific Master of Education option in Educational Administration is available for those who wish to become directors or administrative staff officers in the area of Special Education. Degree candidates who select this option must possess a valid teaching certificate in one or more areas of Special Education. This program involves work in both the Department of Educational Administration and the Department of Rehabilitation and Special Education. Specific course requirements will be prescribed by the student's adviser. (This option will not be available in 1971-1972.)

### **Educational Research**

This program is designed to train educational researchers who will have: 1) an understanding of the nature and characteristics of research as it is carried on in educational research agencies; 2) a basic knowledge of research methodology and related theory that will enable them to assist at all stages of educational research; and 3) the technical skill to carry out independently the operational aspect of educational research.



### *Program for Full-Time Students*

The objectives stated above and the related competences will be achieved through an integrated program of study and related internship experiences. The total program will require five academic quarters (15 months) to complete, three quarters of didactic study and two quarters of internship. (A quarter of didactic study usually consists of 11 weeks of study, one week of examinations, and one week of vacation; an internship quarter consists of 12 weeks of full-time work and one week of vacation.) Candidates will be admitted in June of the academic year, and successful candidates will complete their training in September of the following year (one academic year plus two summers).

Internships are unpaid. Stipends and tuition allowances are available.

The program is organized to permit all students to proceed through it as a group. All candidates will be required to complete the following courses:

Master of Education Core (required of all candidates)

Area I 50.840 Introduction to Educational Research

Two courses from the remaining areas as described on page 38.

Educational Research Requirements

50.814 The Nature and Theory of Psychological and Educational Measurement

50.841 Introduction to Educational Statistics

50.842 Intermediate Educational Statistics

50.843 Research Methods I

50.845 Research Internship and Field Seminar I

50.846 Research Internship and Field Seminar II

50.847 Elements of Machine Data Processing  
Electives

### *Program for Part-Time Students*

The objectives stated above and the related competences will be achieved through an integrated program of study. The part-time program does not require research internships.

All candidates will be required to complete the following courses:

Master of Education Core (required of all candidates)

Area I 50.840 Introduction to Educational Research

Two courses from the remaining areas described on page 38.

Educational Research Requirements

50.814 The Nature and Theory of Psychological and Educational Measurement

50.817 Research Problems in Education

50.841 Introduction to Educational Statistics

50.842 Intermediate Educational Statistics



- 50.843 Research Methods I
- 50.844 Research Methods II
- 50.847 Elements of Machine Data Processing
- Electives

## Reading

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

### Reading Requirements

- 54.801 Foundations of Reading
- 54.802 Reading Disability
- 54.811 Materials Workshop in Reading
- 54.804 Reading Clinic I—Diagnosis and Correction
- 54.805 Reading Clinic II—Diagnosis and Correction
- Electives

## Rehabilitation Administration and Special Education

### *Rehabilitation Administration*

Students majoring in Rehabilitation Administration should anticipate taking 14 credit courses for the degree under either of the following options:

#### Plan A

For students with limited rehabilitation or administration experience. The program will be conducted on a cooperative education basis. This means that the student will alternate periods of academic course work with paid practical experience in the field over a 21-month period.

#### Plan B

For students with considerable rehabilitation or administration experience. The program takes one calendar year from September through August and includes four academic quarters. During this time the student also completes 500 hours of practical experience in the field. Under Plan B there are a limited number of Federal stipends available which are issued on a competitive basis.

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

### Rehabilitation Requirements

- 50.950 Introduction to Rehabilitation
- 50.951 Principles of Medical Rehabilitation
- 50.952 Vocational Rehabilitation and Social Services
- 50.953 Organization and Administrative Theory

- 50.961 Rehabilitation Administration I
- 50.963 Rehabilitation Administration II
- 50.957 Federal-State Relations in Rehabilitation
- 55.832 Group Dynamics
- \*50.960 Practicum in Rehabilitation Administration
- 50.956 Community Planning in Rehabilitation

Electives. Students will be required by their advisers to choose electives from the following courses as they pertain to specific administrative goals.

- 50.958 Social Welfare and Rehabilitation
- 50.959 Rehabilitation Research
- 50.962 Administration of a Sheltered Workshop
- 50.964 Rehabilitation and the Law
- 50.965 Occupational Placement

All students are required to take a noncredit course in fiscal management as part of their program.

### *Speech Pathology and Audiology*

The program leading to the degree of Master of Education in either Speech Pathology or Audiology is designed to qualify candidates for membership in and certification by the American Speech and Hearing Association. Graduates of the program are also qualified for further graduate study and for employment as speech pathologists or audiologists in clinics, hospitals, public schools, and rehabilitation centers.

This program assumes that students have completed an undergraduate preprofessional program in speech and hearing. Those without such preparation will be required to complete additional courses beyond the 48 quarter hours normally required for the master's degree.

This program is conducted in affiliation with the Massachusetts Eye and Ear Infirmary.

### *Speech Pathology*

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed in all major professional areas including: diagnostics, articulation, language, fluency, voice and audiology. The student is also advised about how his program prepares him to meet certification requirements established by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

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\*Required, but does not carry degree credit.

## Speech Pathology Courses

A minimum of nine courses selected from the following or appropriate electives:

- 55.803 Cerebral Palsy
- 55.804 Aphasia and Related Neurological Disturbances
- 55.805 Disorders of Voice
- 55.806 Language Disturbances in Children
- 55.811 Stuttering
- \*55.812 Differential Diagnosis in Speech and Language Pathology
- \*55.813 Advanced Clinical Practice
- \*55.816 Test Procedures in Speech and Language
- 55.817 Advanced Anatomy, Neurology and Physiology of Speech-Hearing Mechanism
- 55.822 Functional and Organic Disorders of Speech
- 55.823 Social Aspects of Communication Disorders
- 55.824 Seminar in Speech Pathology
- 55.860 Aphasia Rehabilitation
- 55.891 Thesis (optional)
- 55.899 Directed Study (optional)

## *Audiology*

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed among evaluation, diagnosis, and aural rehabilitation. The student is also advised about how his program prepares him to meet certification requirements established by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

## Audiology Courses

A minimum of nine courses selected from the following or appropriate electives:

- \*55.813 Advanced Clinical Practice
- 55.814 Clinical Audiometry I
- 55.815 Clinical Audiology
- \*55.817 Advanced Anatomy, Neurology and Physiology of Speech-Hearing Mechanism
- \*55.818 Pathologies of the Ear
- 55.819 Clinical Audiometry II
- 55.820 Physiological Acoustics
- 55.821 Seminar in Audiology
- 55.823 Social Aspects of Communication Disorders

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\*Required or an equivalent.

- 55.825 Teaching Speech to Deaf Children
- 55.826 Teaching Language and Reading to Deaf Children
- 55.828 Aural Rehabilitation
- 55.891 Thesis (optional)
- 55.899 Directed Study (Optional)

### *Teaching the Deaf*

The following curriculum in the preparation of teachers of the deaf is offered in affiliation with the Beverly School for the Deaf. Candidates lacking prerequisite courses will be required to complete them prior to the following program.

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

Teaching the Deaf Requirements

- 55.801 Psychology of Exceptional Children
- 55.814 Clinical Audiometry I
- 55.815 Clinical Audiology
- 55.816 Test Procedures in Speech and Language Pathology
- 55.825 Teaching Speech to the Deaf
- 55.826 Teaching Language and Reading to the Deaf
- 55.827 Methods and Materials in Deaf Education
- 55.828 Aural Rehabilitation
- 55.852 Practicum: Teaching the Deaf (8 quarter hours)

### *Teaching the Emotionally Disturbed*

This program is designed for certified teachers of regular classes who wish to specialize in teaching emotionally disturbed children and youth. Degree candidates may be required to take 50.803, Child Psychology, without degree credit if they have not previously taken a similar course.

Master of Education Core (required of all candidates)

Three courses as defined on page 38.

Teaching the Emotionally Disturbed Requirements

- 50.805 Personality and Social Structure
- or
- 50.810 Psychology of Personality
- 50.807 Abnormal Psychology
- 55.830 Etiology, Dynamics and Treatment of Emotional Disturbance in Children
- \*55.831 Teaching the Emotionally Disturbed: Problems and Strategies

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\*Prerequisites: Etiology, Dynamics, and Treatment of Emotional Disturbance in Children and the permission of the Director of the Division for the Education of the Emotionally Disturbed.

55.836 Practicum in Special Education (8 quarter hours)

53.801 Tests and Test Procedures

or

55.844 Measurement and Evaluation in Special Education

Electives as follows (Students may also choose electives from selected courses from Remedial Reading, Rehabilitation Administration, and Speech Pathology and Audiology programs.):

55.801 Psychology of Exceptional Children

55.807 Learning Disabilities

55.832 Group Dynamics

55.833 Mental Health

55.834 Case Conferences on Emotionally Disturbed Children

55.835 Socio- and Psychodynamics of Family Life

55.837 Seminar: Problems of the Emotionally Disturbed Child

55.843 Industrial Arts and Crafts

55.899 Directed Study

### *Teaching the Mentally Retarded*

This program is designed for individuals who hold certificates for teaching in the regular classroom and wish to qualify as special class teachers in the area of the mentally retarded.

#### Master of Education Core

Three courses as defined on page 38.

#### Teaching the Mentally Retarded Requirements

55.801 Psychology of Exceptional Children

55.840 Psychology of the Mentally Retarded

55.841 Methods and Materials — Trainable Retarded

55.842 Methods and Materials — Educable Retarded

55.843 Industrial Arts and Crafts

55.844 Measurement and Evaluation in Special Education

55.846 Practicum in Special Education

55.847 Vocational Education for the Handicapped

\* ——— Statistics — Descriptive (prerequisite — may be taken through Center for Programmed Instruction)

#### Electives

50.807 Abnormal Psychology

53.802 Vocational Development and Occupational Information

54.802 Reading Disability

54.804 Reading Clinic I — Diagnosis and Correction

54.805 Reading Clinic II — Diagnosis and Correction

\*Required, but does not carry degree credit.

- 55.803 Cerebral Palsy
- 55.804 Aphasia and Related Neurological Disturbances
- 55.807 Learning Disabilities
- 55.837 Seminar: Problems of the Emotionally Disturbed Child
- 55.845 Rehabilitation for Special Education Teachers
- 55.899 Directed Study

**NOTE:** A specific Master of Education option in Educational Administration is available for those who wish to become directors or administrative staff officers in the area of Special Education. Degree candidates who select this option must possess a valid teaching certificate in one or more areas of Special Education. This program involves work in both the Department of Educational Administration and the Department of Rehabilitation and Special Education. Specific course requirements will be prescribed by the student's adviser. (This option will not be available in 1971-72.)

## **TEACHER PREPARATION**

### **Master of Education**

#### **Program of Studies**

Applicants who do not possess a valid teaching certificate are offered a program designed to prepare them for state certification and concurrently fulfill the requirements for a Master of Education degree. Initial preparation programs are available for elementary and secondary teaching fields. No student will be permitted to do student teaching except as a part of the appropriate teacher preparation program for the Master of Education degree.

If preparation courses in general psychology, child psychology or adolescent psychology have not been taken previously, applicants will be required to take such work in addition to degree requirements. Such courses carry graduate credit but may not be included in a degree program. The Director of the Graduate School of Education will determine when these requirements have been satisfied.

#### **Student Teaching**

Applications for student teaching must be received by the Director of the Graduate School of Education no later than October 15. Student teaching in the graduate program is scheduled for the Spring Quarter.

Acceptance in the student teaching program is contingent upon:

- An academic average of B or better in all courses pursued in the Graduate School of Education.
- The recommendation of the student's major adviser.

Ordinarily, student teaching will not be permitted until the following courses have been completed: 50.806, Psychology of Learning; 51.801, Curriculum of the American School; the special method(s) course(s) and any preparation courses that are necessary.

Because of the unique demands of student teaching, participants may not enroll for additional courses concurrent with student teaching without the recommendation of the major adviser and the approval of the Director.

### **Elementary Education**

Preparation Courses (if not taken previously): General Psychology and Child Psychology.

Master of Education Core (required of all candidates)

- 50.806 Psychology of Learning
- 50.815 Research Design in Education
- \_\_\_\_\_ A third course as defined on page 38

Elementary Education Requirements

- 51.800 Principles of Teaching
- 51.801 Curriculum of the American School
- 51.802 Procedures of Evaluation
- 51.805 Student Teaching and Seminar (8 quarter hours)
- 51.810 Elementary Mathematics, Content and Methods (special methods)
- 51.834 Elementary Science Methods and Curriculum (special methods)
- 54.800 Introduction to Reading and Language Skills (special methods)

Electives

### **Secondary Education**

Preparation Courses (if not taken previously): General Psychology and Adolescent Psychology.

Master of Education Core (required of all candidates)

- 50.806 Psychology of Learning
- 50.815 Research Design in Education
- \_\_\_\_\_ A third course as defined on page 38

Secondary Education Requirements

- 51.800 Principles of Teaching
- 51.801 Curriculum of the American School
- 51.802 Procedures of Evaluation
- 51.805 Student Teaching and Seminar (8 quarter hours)
- \_\_\_\_\_ Special Methods in the major subject area (two courses for science)

Electives

### **CERTIFICATE OF ADVANCED GRADUATE STUDY**

The Certificate of Advanced Graduate Study is available to applicants who have demonstrated a strong background in the special field of study at the master's level and who meet the specific requirements of the Graduate School of Education and the appropriate department. CAGS programs are offered in the areas of:

Counselor Education  
Educational Administration

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

#### **Counselor Education**

Students entering the CAGS program in counselor education are presumed to have a master's level preparation the equivalent of that offered at Northeastern. This means, at a minimum level, the completion of a supervised practicum. Any student whose master's preparation was lacking a supervised practicum will be required to take the 53.805, 53.806 sequence in addition to the minimum requirements for the CAGS. Additional courses may also be required from the master's program in order to make up deficiencies.

Students in the CAGS program should identify their main professional goal in terms of either guidance and pupil services, college counseling and student personnel, or community-rehabilitation counseling so as to facilitate the planning of both an appropriate program and an appropriate field work placement. The general program requirements are described below.

#### 53.840, 53.841 Field Work Specialization (8 quarter hours)

Ten additional courses are to be selected with the approval of an adviser providing that at least three of these courses be taken outside the Department of Counselor Education. A minimum of five courses must be selected from among department offerings. Any counselor education course numbered 53.807 or higher may be taken for CAGS credit as long as it has not been previously taken for master's degree credit.

Applicants for the CAGS will be accepted during the period of April 1 to November 1, with a deadline of September 15 to complete all application procedures. After filing all application materials required by the Graduate School, the applicant must arrange for an interview with the Department of Counselor Education before final action can be taken on admission. Since there is a limited number of spaces in the CAGS program, early application is urged.



## Educational Administration

The Certificate of Advanced Graduate Study (CAGS) program in Educational Administration is designed to provide the student with a closer examination of a particular administrative or supervisory position. Extending beyond the generic master's degree program, major emphasis is given to role specialization and the particular skills that should be acquired by prospective and practicing school administrators. Completion of this program should develop further the leadership capabilities essential to the student's area of specialization such as: the principalship of a large school, the assistant superintendency, the superintendency of a small district or supervisory union, directorship of Federal, system-wide, or state education department programs, or higher education administrative positions.

*A minimum of 12 courses beyond the master's degree is required for completion of the program.*

### Core Courses (required)

- 52.830 Current Issues in Educational Administration
- 52.831 Innovation and Change in American Public Schools
- 52.832 The Process of Administration

### Electives

- 52.833 Research and Statistical Methods for School Administrators
- 52.834 Educational Finance
- 52.835 School Business Management
- 52.836 Personnel Administration
- 52.837 School-Community Relations
- 52.838 School Plant Planning
- 52.839 Operation and Maintenance of the School Plant
- 52.840 Problems in School Administration: A Simulated Experience — The Superintendency
- 52.841 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Business Management
- 52.842 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Instructional Services
- 52.899 Directed Study
- 52.843 Administrative Internship
- 52.844 School Law

*NOTE: In addition, the adviser may prescribe courses outside the Department of Educational Administration.*

# description of courses

All courses carry four quarter hours of credit unless indicated otherwise. Please see the current brochure for summer, fall, winter, and spring quarter listings.

## Prerequisite Courses

Several programs require satisfactory completion of prerequisite courses. These courses include:

Descriptive Statistics	} No charge, no credit courses offered by the Center of Programmed Study.
Inferential Statistics	
General Psychology	
50.803 Child Psychology	} See course descriptions.
50.804 Adolescent Psychology	
50.841 Statistics	

## FOUNDATIONS OF EDUCATION

### 50.801 Social Foundations of Education

Introduction to the behavioral sciences. Major concepts, propositions, and theoretical orientations in cultural anthropology, sociology, and social psychology.

### 50.802 Sociology of Education

The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives. The school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise. *Prep. See page 38.*

### 50.803 Child Psychology

A review of the principles of child development from birth to pre-adolescence. Particular emphasis will be placed on intellectual, social, and emotional development. The theoretical formulations of psychoanalysis, social learning theory, and Piaget will be discussed in the context of relevant research in these areas, as well as their educational implications. *Prep. General Psychology.*

*For Teacher Preparation degree candidates only (may not be used to satisfy the degree requirement of a minimum of 40 quarter hours and 12 courses).*

### 50.804 Adolescent Psychology

Social, emotional, and intellectual development through the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material. *Prep. General Psychology.*

*For Teacher Preparation degree candidates only (may not be used to satisfy the degree requirement of a minimum of 40 quarter hours and 12 courses).*

**50.805 Personality and Social Structure**

Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology.

**50.806 Psychology of Learning**

The basic principles and conditions of acquisition, retention, and transfer of learning. *Prep. See page 38.*

**50.807 Abnormal Psychology**

How personality becomes disordered. Problems of neurosis, character disorders, psychosomatic disorders, and psychoses. Current methods of clinical diagnosis and treatment will be reviewed.

**50.808 Seminar in Child Development**

A seminar course with emphasis on discussion of child development theories with special reference to personality and cognitive development. Critical evaluation of research related to child development theories with particular emphasis on recent trends, new approaches, and relevance to educational theories and practices. *Prep. A course in Child Psychology or Human Development.*

**50.809 Seminar in Adolescent Development**

A seminar course with emphasis on discussion of major problem areas facing the adolescent in our society today. Particular emphasis will be given to social and emotional development. Included will be a survey of research in such areas as psychoanalysis, social learning, morality, and delinquency. *Prep. A course in Adolescent Psychology or Human Development.*

**50.810. Psychology of Personality**

An examination of theoretical approaches to the study of personality, with emphasis upon theories dealing with dynamic factors in personality development. The role of social and cultural factors, as well as implications of various theories for the therapeutic processes, will be considered. *Prep. See page 38.*

**50.811 Psychology of Cognition**

A consideration of the processes involved in cognitive organization and functioning. Topics will include: language, concept formation, and problem solving. *Prep. See page 38.*

**50.812 History of Education**

An opportunity to explore some of the historical roots of contemporary educational theory and practice, with a focus on selected aspects of educational history from antiquity to the present. Also, an opportunity to utilize any knowledge gained for the development of a personal educational position.

**50.813 Philosophy of Education**

An introduction to the basic precepts of philosophy as viable tools with which to build a philosophy of education. An analysis of major philosophic world-frames in their historical context; i.e. Aristotelian, Thomistic, idealistic, realistic, and pragmatic. An examination of philosophies of education which cover the

broad spectrum of thought, ranging from authoritarian to democratic, determining from this examination where along the continuum to place the foundation from which to build one's own personal philosophy of education to be translated into conduct in the classroom.

#### **50.814 The Nature and Theory of Psychological and Educational Measurement**

An examination of the logic of measurement and the nature of human capacities, aptitudes, and abilities. Characteristics of tests, ratings, questionnaires, and similar instruments are reviewed with emphasis on their reliability, validity, and useability. Item analysis procedures and test standardization are covered. (*May not be offered in 1971-1972.*)

#### **50.815 Research Design in Education**

An introduction to scientific methods of research in education and related fields. Stress will be placed on a critical reading and understanding of research literature, formulating research hypotheses, the formulation of a research proposal, and carrying out an individual or group project.

A course in statistics or competence in this field is required prior to taking this offering. A no-credit, no-charge course in statistics has been arranged for this purpose and is available through the University's Center of Programmed Study. The regular tuition course, 50.841, is also available.

#### **50.817 Research Problems in Education**

Each student will identify a research problem, review the relevant research literature, design an appropriate methodology, and prepare a written research proposal. *Prep. 50.815 Research Design in Education or 50.840 Introduction to Educational Research. (May not be offered 1971-1972.)*

#### **50.818 Comparative Education**

Introduction to foreign education to explore its relationships with the political, economic, social, and cultural milieu: Western and Eastern Europe, South America, and Africa will be considered.

#### **50.819 Theories of Developmental Psychology**

The major developmental theories and related research of Havighurst, Erickson, Piaget, and others. *Prep. Permission of instructor.*

#### **50.820 Seminar on Contemporary Issues in Education**

Discussion of selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Review of relevant research and opinions.

#### **50.840 Introduction to Educational Research**

An introduction to the rationale and procedures for educational research: the use of theory in the formulation of research problems and hypotheses; review and summarization of research literature; isolation and definition of variables; and design of educational studies and experiments. *Open only to Educational Research majors. (May not be offered 1971-1972.)*

**50.841 Introduction to Educational Statistics**

Basic descriptive statistics for measurement and research. Topics include use of statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distributions, linear regression and correlation, and an introduction to statistical inference.

**50.842 Intermediate Educational Statistics**

Statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other non-parametric tests. Emphasis is given to application in educational research. (*May not be offered 1971–1972.*)

**50.843 Research Methods I**

Each student will begin to carry out a research study designed in a prior research course, i.e., select and prepare instruments for data collection, select sample and arrange for data collection, prepare data analysis schedules, etc. Individual conferences and group meetings will be held. *Prep. 50.817 Research Problems in Education or 50.845 Research Internship and Field Seminar I. (May not be offered 1971–1972.)*

**50.844 Research Methods II**

Each student will complete the research study designed in 50.817 Research Problems in Education. A written report of the completed research study will be submitted at the end of the course in partial fulfillment of degree requirements (in programs where a supervised research project is required). *Prep. 50.843 Research Methods I. (May not be offered 1971–1972.)*

**50.845 Research Internship and Field Seminar I** (6 Quarter Hours)

Students will be assigned to a variety of educational research agencies. For a period of 12 weeks, each student will work in one research setting gaining first-hand experiences with ongoing research. Students will be closely supervised on a regular basis by staff members from within the agencies and by University faculty members. Concurrent with their field placement all interns will be required to attend a seminar. The seminar is designed to help the student to develop an integrated, overall view of the internship experience through analysis of: the types of problems selected for investigation; the research strategies and tactics employed; the procedures utilized in disseminating research findings; the kinds of funding available from governmental and private agencies, and liaison relationships with the schools. Each student will, in collaboration with his internship supervisors, identify a relevant research problem. He will then review the research literature, design an appropriate methodology, and prepare a written research proposal for a study to be carried out in partial fulfillment of degree requirements. *Open only to Educational Research majors. (May not be offered 1971–1972.)*

**50.846 Research Internship and Field Seminar II** (6 Quarter Hours)

Students will return to the agencies in which they were originally placed. Close supervision of agency and University staff will continue. Concurrent with their field placement, all interns will be required to attend a seminar, which will be a continuation of Field Seminar I. Part of the intern's time will be devoted to the completion of the research study designed in 50.845 Research Internship and

Field Seminar I. A written report of the completed research study will be submitted at the end of the course in partial fulfillment of degree requirements in Educational Research. *Open only to Educational Research majors. (May not be offered 1971-1972.)*

#### **50.847 Elements of Machine Data Processing**

A laboratory course designed to develop facility in the use of a wide range of data processing equipment in educational research. Students will be introduced to the basic principles of computer programming, but emphasis will be placed on the applicability and use of existing statistical programs. *(May not be offered 1971-1972.)*

#### **50.891 Thesis**

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

#### **50.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

### **INSTRUCTION**

#### **51.800 Principles of Teaching**

A consideration of the rational bases for effective teaching. Efforts are made to relate learning theory and educational objectives to various strategies and tactics of teaching. The functions of the teacher are examined as components of learner development.

#### **51.801 Curriculum of the American School**

Designed for in-service and prospective teachers, school administrators, and supervisors. Covers such topics as: influence on the curriculum, who determines the curriculum, theoretical curriculum issues, implementing curriculum improvements, what constitutes an up-to-date curriculum.

#### **51.802 Procedures of Evaluation**

Consideration is given to evaluation as a process for the improvement of learning and instruction. The course concerns itself with such topics as how to measure and evaluate affective, psycho-motor, and cognitive dimensions of student growth; test construction; collecting and administering standardized tests; various bases of grading; and methods of reporting student progress.

#### **51.805 Student Teaching with Related Seminar**

(8 Quarter Hours)

A University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. See requirements under Student Teaching.

**51.810 Elementary Mathematics, Content, and Methods**

The modern elementary mathematics curriculum and the conceptual approach to the meaningful teaching of arithmetic. Topics include sets, numeration systems, and operations with whole numbers and fractional numbers.

**51.811 Elementary Number Concepts for Teachers**

The concepts of the real number system and its subsystems underlying school mathematics. *Prep. A modern elementary mathematics course.*

**51.812 Elementary Algebraic Concepts for Teachers**

The algebraic concepts underlying school mathematics, including variables, open sentences, order, modulo systems and polynomials. *Prep. 51.811 Elementary Number Concepts for Teachers, and high school algebra.*

**51.813 Elementary Geometric Concepts for Teachers**

The geometric concepts underlying school mathematics, including abstraction, measurement, separations, congruence, similarity, and graphs. *Prep. 51-811 Elementary Number Concepts for Teachers, and high school geometry.*

**51.814 Elementary Mathematics, Advanced Methods and Materials**

The analysis and evaluation of a variety of modern methods of teaching elementary mathematics both for group instruction and for individualized instruction, including modern textbooks, programmed materials, manipulative devices, multimedia aids, and diagnostic techniques. *Prep. 51.812 Elementary Algebraic Concepts and teaching experience.*

**51.815 Seminar in Mathematics and Science in the Elementary School**

The practical aspects of coordinating a K-6 science and mathematics program in a public-school district. *Prep. Permission of instructor.*

**51.823 Modern High-School Mathematics, Content, and Methods**

Study of students, teaching methods and courses in mathematics for grades 7-9, with emphasis on modern topics, including sets, numeration systems, number systems, and elementary algebra.

**51.824 High-School Geometry, Advanced Content and Methods**

A study of students, teaching methods, and courses in geometry with re-examination of selected background topics, including two-value logic, methods of proof, postulational systems, and analytical methods. *Prep. 51.823 Modern High-School Mathematics or teaching experience.*

**51.825 Seminar in Mathematics Education**

Each student is expected to analyze a mathematics teaching problem, to investigate existing solutions for it, and to prepare materials embodying his own proposed solution. *Prep. Permission of instructor*

**51.826 High-School Algebra, Advanced Content and Methods**

An examination of teaching methods, including the use of computers, and a re-examination, in depth, of selected topics, such as equations and inequalities, real and complex numbers, and vectors and matrices. *Prep. 51.823 Modern High-School Mathematics or teaching experience.*



**51.827 Advanced High-School Mathematics**

An examination from an advanced viewpoint of topics found in high-school courses concerned with elementary functions and analytic geometry, including polynomial, rational, algebraic, logarithmic, exponential, and trigonometric functions, treated both algebraically and geometrically. *Prep. 51.823 Modern High-School Mathematics or teaching experience.*

**51.828 Teaching Elementary Calculus**

An examination from an advanced viewpoint of selected topics in elementary calculus, including limits applied to formal differentiation, continuity, uniform continuity and intermediate values, boundedness and existence of extremes, differentiable functions, areas and integration, and properties of the Riemann integral. *Prep. 51.823 Modern High-School Mathematics or teaching experience.*

**51.829 General Mathematics, Content and Methods**

An examination of students, teaching methods, and courses in general mathematics and related high-school courses.

**51.830 Concepts of Earth Science for Elementary Teachers**

Selected topics in the earth sciences considered from a philosophical and/or historical point of view, with laboratory work.

**51.831 Concepts of Biology for Elementary Teachers**

Selected topics in the biological sciences considered from a philosophical and/or historical point of view, with laboratory work.

**51.832 Concepts of Physical Sciences for Elementary Teachers**

Selected topics in the physical sciences considered from a philosophical and/or historical point of view, with laboratory work.

**51.833 Teaching Elementary School Science**

The teaching of elementary school science from both a practical and philosophical point of view. Materials, resources, and methods, as well as several areas of science subject matter. *Prep. 51.831 Concepts of Biology for Elementary Teachers; 51.832 Concepts of Physical Sciences for Elementary Teachers.*

**51.834 Elementary Science Curriculum**

A general course in content and methods of teaching science in the elementary school classroom. Satisfies one elementary specialized-methods course requirement.

**51.835 The Teaching of High School Science I**

The first half of a two-quarter course, principally for secondary school teachers. Problems of observations of scientific facts, their discovery, the derivation of scientific principles from elaboration of hypotheses, experimentation and reasoning with these facts will be analyzed in terms of the learning process. The different fields of science will be considered, stressing especially their interdependence and their unity of methods and of reasoning.

**51.836 The Teaching of High School Science II**

Continuation of 51.835, The Teaching of High School Science I. During the second half of the course, plans for modern science courses in various fields will be elaborated.



**51.840 The Teaching of English in the Secondary School**

A study of basic methods and materials for teaching English in the secondary school; language, literature and writing as they interact in the English curriculum.

**51.842 The English Curriculum**

A study of the design and function of the English curriculum; selected current issues as they impinge upon the English curriculum; the design and function of research in the English curriculum. Required of all candidates for the Master of Education in Curriculum and Instruction: English. Must be completed at the mid-point of a candidate's program. *Prep. Permission of instructor.*

**51.843 Literature in the English Curriculum**

An examination of the historical-social, psychological, personal, archetypal, textual, biographical, and philosophical-moral aspects of literary study and their relation to the chronological, thematic, and generic demands of the literature program; the sources of interest in literature as they relate to the young reader and their implications for the English curriculum; the interrelatedness of literature and the other components of the English curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842 The English Curriculum or permission of instructor.*

**51.844 Writing in the English Curriculum**

A study of the cognitive and affective bases of imaginative and nonimaginative writing; the role of writing in the relationship between self and object; modes of imaginative and nonimaginative writing appropriate to the young writer; the impulse to expression in the young writer and its implications for the English curriculum; the inter-relatedness of writing and the other components of the English curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842 The English Curriculum or permission of instructor.*

**51.845 The Teaching of Modern Languages in the Secondary School**

Through the case method and group discussions, the most effective types of class activities, subject unit presentation, assignments, examinations, and aids used in teaching modern languages will be considered. The role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instructions will be discussed and demonstrated.

**51.847 Language in the English Curriculum**

An examination of the multiple dimensions of language study in the English curriculum; the role of inquiry in the study of language and its implications for the English curriculum; theories of grammar and their relation to the study of language in the English curriculum; the inter-relatedness of writing and the other components of the English curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842 The English Curriculum or permission of instructor.*

**51.849 Topics in English Education**

An investigation of a matter of immediate concern to English Education but for which no organized study is ordinarily available. Typical topics are: Media in

the English Program; Behavioral Objectives in the English Program; The English Program for the Disadvantaged. Each year the seminar topic for that year is announced prior to registration.

The topic for 1971-1972 will be: The Psychoanalytic Bases of Literary Response—a study of the psychoanalytic foundations of literary response in children, adolescents, and adults; implications for the study of literature in the English curriculum.

#### **51.850 The Teaching of Social Studies in the Secondary School**

Developments in methods, materials and curriculum. Consideration will be given to such topics as the following: the teacher of the social studies; objectives of social studies instruction; social studies programs; controversial issues; current events; visual and auditory aids; field trips; evaluation.

#### **51.851 Seminar in Current Issues in the Social Studies**

A content approach to problems of political and social significance which have contemporary relevance for teachers of the social studies on a secondary level.

#### **51.852 Teaching Elementary Social Studies**

This course will help students to select topics in the social sciences and plan their classroom use so as to develop critical thinking and an understanding of the values, attitudes and social skills that characterize an open society. After analyzing materials prepared by others, students will research and organize independent units of study. Throughout, the use of a developmental approach (conceptual and organizational) will foster an orientation that requires substantive supportive criteria as fundamental to constructive change.

The student should as a result of the experiences provided see his future role more clearly. Thus, the teaching role from the social studies vantage point is not only that of transmitter of a social heritage but also that of a catalyst in encouraging pupils to concern themselves with, and to participate in social reform to the degree suitable from the primary level on.

#### **51.855 The Teaching of General Business Subjects**

Current trends in the teaching of social business subjects, such as general business, economics, economic geography, business law, and consumer education. Objectives, nature of subject matter, teaching aids and devices, tests and measurements, textbooks, and supplementary materials are studied.

#### **51.861 Principles of Programmed Instruction**

The development and current status of self-instructional devices. A survey of available programs and teaching machines, with emphasis on the details of the construction evaluation of programs.

#### **51.891 Thesis**

A research activity that may be elected by the student in lieu of two courses (8 quarter hours,) with the approval and recommendation of the adviser.

#### **51.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of

the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

### **51.900 Cooperative Education in American Higher Education**

An examination of cooperative education as a complex tool for achieving goals of education. Attention will be directed to its psychological implications for the individual, its social implications for the nation, and its place in educational thought. American higher education will be the principal focus of these considerations.

## **EDUCATIONAL ADMINISTRATION**

### **52.805 Simulated Problems: Secondary School Administration**

The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of a secondary school. Background materials have been prepared which describe all aspects of a fictitious school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the fictitious community as well as through written materials. *Prep. 52.810, 52.811 or permission of instructor.*

### **52.806 Directed Field Experiences in School Administration I**

The Directed Field Experiences in School Administration is a course required of all master's candidates who are majors in school administration. Study and discussion of administrative functions will be coordinated with selected field trips to administrative settings and with guest lectures by practicing administrators. These experiences will include considerations of Federal, state, local, higher education, and allied (such as the educational regional laboratory and school study council) agencies to view actual on-going administrative operations. These activities will be viewed as laboratory experiences to provide a basis for an increased understanding of administrative theory and practice. *Prep. 52.810, 52.811 or permission of instructor.*

### **52.807 Directed Field Experiences in School Administration II**

A continuation of, but may precede, 52.806.

### **52.808 Seminar in Educational Administration**

A culminating experience for students majoring in school administration at the master's level. A student is confronted with major issues facing the school and its administrators. Great emphasis is placed upon applying knowledge gained in previous administrative courses to an understanding of contemporary educational problems. *Prep. 52.810, 52.811 or permission of instructor.*

### **52.810 and 52.811 Leadership in Education: Parts I and II**

A two-term course designed to introduce the student to concepts of formal organization. Presented in a two-part sequence, this core is prerequisite to further study in the Department of Educational Administration.

The core provides the student with an overview of formal organizations as social systems with special consideration given to the leadership function. Examina-

tion will be made of both the institutional and human dimensions as inter-related phenomena. *52.810 must be completed before enrollment in 52.811.*

#### **52.812 An Overview of the Administrative Tasks**

A survey of the operational areas of concern to the educational administrator. Included will be the following task areas: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811 or permission of instructor.*

#### **52.813 Instructional Leadership: Curriculum Development and Supervision**

Views the leadership function and processes involved in the design and improvement of educational programs and instructional practices. *Prep. 52.810, 52.811 or permission of instructor.*

#### **52.814 Simulated Problems: Elementary School Administration**

The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of an elementary school. Background materials have been prepared which describe all aspects of a fictitious school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the fictitious community as well as through written materials. *Prep. 52.810, 52.811 or permission of instructor.*

#### **52.891 Thesis**

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendations of the adviser.

#### **52.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

### **CAGS COURSE OFFERINGS IN EDUCATIONAL ADMINISTRATION**

*(Open only to CAGS degree candidates in Educational Administration or by special permission of the chairman of the department granted prior to registration.)*

#### **52.830 Current Issues in Educational Administration**

A seminar required of all students pursuing the CAGS. Critical and contemporary issues which face school administrators will be examined closely. The status of the administrator; Federal, state, and local revenue sources; accountability; the voucher plan; teacher militancy; equal educational opportunity; conflicts with religious organizations; control of schools; urban education problems; cultural deprivation, and human rights are examples of topics that will be analyzed.

**52.831 Innovation and Change in American Public Schools**

A seminar required of all students pursuing the CAGS. Although major emphasis will be given to curriculum and instruction, attention will also be given to planned change in other critical areas such as team teaching, modular scheduling, nongradedness, educational parks, programmed instruction, in-service education, individualizing education and teacher-learner relationships.

**52.832 The Process of Administration**

A seminar required of all students pursuing the CAGS. Gaming, case analysis, and discussions will be utilized to gain insight into such issues as morale, satisfaction, perception, and decision-making.

**52.833 Research and Statistical Methods for School Administrators**

A study of the application of the methods of research and statistical techniques in the solution of school system problems. The role of research in the administrative decision-making process will be examined. The course of study will also focus on the various research designs the administrator may use in his position, such as the development of an educational program proposal for local, state, or Federal agencies.

A specific topic of practical significance in school administration will be selected by the student and a design for the study of the topical problem will be developed. Research relevant to the topic will be evaluated.

A rudimentary knowledge of research designs and techniques and an elementary knowledge of basic statistical methods is recommended prior to taking this course.

**52.834 Educational Finance**

The study of school finance deals with the principles and problems of financing education and also considers the basic concepts of economics relative to the place of school finance in the field of public finance. The sources and rationale for public support of schools are examined. Selected state and Federal aid programs, capital outlay programs, current practices and issues of local support and bond issue campaigns are included in this study.

**52.835 School Business Management**

The practices and issues in the administration of school business affairs. The role of the business administrator and the educational budget will be examined. Included in this course will be the principles of budget preparation and development, purchasing, supply management and distribution, inventory control, debt service administration, bond scheduling, cash flow, school accounting and data processing systems, auditing, financial reporting, and management of payroll, insurance programs, transportation programs, school food services, and the operation and maintenance programs for the physical plants.

**52.836 Personnel Administration**

The purposes, patterns, and issues in personnel administration are the major considerations of the course. Study will include the skills, attitudes, and knowledge which an institutional staff needs to have and which are essential to the accomplishments of organizational goals. Personnel administration programs and problems of student personnel, para-professional, nonprofessional, and professional staff members will serve as the focus for the course.

**52.837 School-Community Relations**

This course includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Selected research findings relative to public relations programs in business, industry, and governmental agencies will be reviewed in addition to those involving educational systems. Stress will be placed on the role of the administrator in the development of a comprehensive program of school-community relations for his administrative unit.

**52.838 School Plant Planning**

This course seeks to have the student develop a basic understanding of the process of planning school facilities. This process includes the preparation of educational specifications based on such factors as school board policies, the existing and projected educational programs, school organization, school building utilization and adequacy, population projections, and total community analyses. Other components of school plant planning will be studied, including the selection of the architect, the translation of the educational specifications into building specifications, the development of the building program brochure, and the administrator's role in working with the building committee and architect in the actual design of the building. The relationships between the educational program, such as a highly individualized flexible program, and the building design, such as an "open school" design, will be a continual focus in the course.

**52.839 Operation and Maintenance of the School Plant**

The techniques and procedures involved in providing a clean, safe, and healthful physical environment for school personnel are the major considerations in this course.

The selection, assignment, and supervision of the custodial and maintenance staffs and the organization and management of the custodial and maintenance programs are the major areas of study. Considerable emphasis will be placed on review and study of the research relative to operating a school facility as well as on such matters as appropriate painting schedules, replacement schedules for mechanical systems, floor-ceiling-roofing materials, and purchasing and supplying techniques. Statutes or regulations pertaining to the operation of schools, such as those of the State Board of Health, the State Fire Marshal, Insurance Underwriters, and Boiler Inspectors, will be studied also.

**52.840 Problems in School Administration:**

**A Simulated Experience — The Superintendency**

**52.841 Problems in School Administration:**

**A Simulated Experience — Assistant Superintendent for Business Management**

**52.842 Problems in School Administration:**

**A Simulated Experience — Assistant Superintendent for Instructional Services**

These courses are designed to place each student in a simulated decision-making situation in his area of concentration. Background materials have been prepared which describe all aspects of a fictitious school system including its publics, policies, certified and noncertified staff members, and the geographical



and socio-economic makeup of the community. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in this community as well as through written materials.

#### **52.843 Administrative Internship**

This is an individualized offering involving supervised observations, internships, and externships in educational administration and it is designed to provide further practical experience in the student's area of administrative preparation. The administrative internship program must be worked out well in advance with the adviser.

#### **52.844 School Law**

The student will be expected to develop a basic understanding of Federal and state laws that apply to school systems, educational programs, and personnel as well as of the legal prerogatives available to the practicing administrator and the local boards of education. This study will include consideration of the constitutional, statutory, and common-law foundations of educational systems and the school administrator's role with respect to them.

#### **52.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

### **COUNSELOR EDUCATION**

#### **53.800 Foundations of Guidance and Human Services**

A philosophically, theoretically oriented course dealing with the current social context of the "counter-culture," the nature of humanness, and the relation of these two aspects to guidance services in schools and human services in other educational and community settings. Course procedures will emphasize the development of student self-understanding and increased awareness of social and institutional structures and their effect on human beings. The helping person as an agent of social and institutional change will be the focus of the latter half of the course.

#### **53.801 Tests and Test Procedures**

The principles and problems of psychological testing as applied to the work of the counselor are discussed. Some consideration is given to technical concepts as they apply to the treatment, use, understanding, and interpretation of test scores. The student is made familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest, and personality. Tests are evaluated for use in education and guidance. Problems of test interpretation are discussed briefly.

#### **53.802 Vocational Development and Occupational Information**

A dual-emphasis course dealing, first, with theories about how individuals make decisions concerning their choice of vocation, and second, with the kind of data which is needed to assist people with these decisions. This requisite data deals with the following areas: the relationship of social and economic change to occupational trends; the classification and description of occupational fields;

methods of collecting, evaluating, filing, and disseminating vocational information; and the role of the counselor in fulfilling these functions.

**53.803-53.804 Counseling Theory and Process I and II** (8 quarter hours)

A two quarter course in counseling open only to students who have been admitted to degree candidacy in counselor education. Students will be expected to take both parts of the course in consecutive quarters and concurrent with the Counseling Practicum courses. The course will integrate theory and practice in counseling from the beginning of the first term. Students will engage in role playing, case studies, and practice counseling as well as studying counseling theories. Emphasis will be placed on student self-exploration and self-understanding in the counseling process. *Prep. 53.800 Foundations of Guidance and Human Services and 53.801 Tests and Test Procedures (may be taken concurrently with 53.803).*

**53.805-53.806 Counseling Practicum** (8 quarter hours)

The counseling practicum is a supervised counseling experience extending over the academic year. Students will begin their practicum in the same quarter in which they begin the Counseling Theory and Process sequence. Emphasis at the beginning of the year will be on small group seminars dealing with counseling and other guidance matters. The second half of the year will concentrate on the supervised counseling assignment. Assignment to practicums will be made according to the student's major area of concentration — elementary, secondary, college or community. Students must make themselves available a minimum of a half day per week for the first half of the year and a full day (or its equivalent) the second half of the year for placement in a field setting. Seminars will stress material germane to the student's major.

Part-time students must submit an application for practicum (available from the Department) by June 30 for approval to enroll in the practicum the following Fall Quarter. *Prep. Approval of the Department of Counselor Education.*

**53.807 Administration of Guidance Services**

An advanced level guidance course designed to help meet the certification requirements for guidance directors in Massachusetts. The course will cover philosophies, principles, and methods of establishing and administering guidance programs in the public schools. Simulated materials are used to replicate actual guidance problems dealing with testing programs, budgeting, interpersonal relationships and other practical matters.

**53.808 Group Counseling**

This course will both affectively and cognitively introduce students to behavioral phenomena characteristic of counseling with groups of individuals at various levels of development. The basic assumptions determining the course content are, first, that students must involve themselves in a genuine group counseling experience in order to understand key phenomena intrinsic to methods for behavior modification; and second, that this information can then be used as a basis for rendering relevant theoretical knowledge and counseling skills more concretely meaningful. Therefore, in Group Counseling, principal emphasis will be placed upon student involvement in classroom group process.

*Prep. 53.803 Counseling Theory and Process I.*



**53.809 The College Student and His Campus**

The relationship between college students and their environment will be examined. Focus is on student rights, self expression, emotional concerns, and their search for identity. Varying concerns of personnel services in different types of college climates will be studied. The student and the college campus will be examined in relation to the goals of higher education.

**53.810 Vocational and Personal Development in the Elementary School**

Required for elementary guidance majors, this course is designed to meet Massachusetts certification requirements in guidance by providing an elementary level focus for the consideration of vocational development and the use of occupational information. This consideration, however, will be set in the context of the elementary guidance specialist's role as a counselor/consultant on both the vocational and personal/educational development of elementary school pupils.

**53.811 Family and Parent Counseling**

The family will be studied as an institution, as an arena of interpersonal transaction and as a seed-bed both of distress and of health. Various modes of counseling families will be presented, together with the theoretical notions underlying their use. The course will also demonstrate counselor-parent relations in the context of the school setting. *Prep. 53.803-53.804 Counseling Theory and Process I & II or permission of instructor; 53.804 may be taken concurrently.*

**53.812 Seminar in Student Personnel Work**

Relevant topics and cases for personnel workers and administrators in higher education will be discussed and studied in depth. The expertise of appropriate specialists will be utilized. *Prep. 53.809 The College Student and His Campus or permission of instructor.*

**53.823 Measurement of Intelligence: Stanford-Binet Scales**

Preparation to administer, score, and interpret the Stanford-Binet Test of Intelligence. Consideration of theories of intelligence as they apply to the Binet scales and their development; use of the test in educational settings. Each student will be required to administer and score 25 tests. *Prep. 53.801 Tests and Test Procedures.*

**53.824 Measurement of Intelligence: Wechsler Scales**

Preparation to administer, score, and interpret the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Intelligence Scale for Children (WISC). Study of the theory and development of the test; its use in education and counseling. Each student will be required to administer 25 tests. *Prep. 53.801 Tests and Test Procedures.*

**53.891 Thesis**

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

**53.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

## CAGS COURSE OFFERINGS IN COUNSELOR EDUCATION

### **53.831 Advanced Group Counseling**

This course will be a continuation of the content presented in Group Counseling, placing greater emphasis on developing skill in conducting group counseling at a variety of age levels. Greater attention will be given to relevant readings and research on group process and methods for behavior modification. *Prep. 53.808 Group Counseling or permission of instructor.*

### **53.833 Seminar in Counseling Supervision and In-Service Education**

Supervisory methods of improving the effectiveness of school counselors' skills in counseling and other aspects of guidance work, of involving counselors in the improvement of the guidance program, and of enhancing the personal growth of the counselor. *Prep. Master's Degree in Guidance or permission of the instructor.*

### **53.834 Strategies and Theory of Behavior Change**

An advanced level counseling course designed to integrate the two major approaches to counseling, relationship counseling based on "self theory" and behavioral counseling based on behavioristic psychology. The two theoretical positions will be explored in depth and conceptually integrated. The student will be assisted in the further development of skills appropriate to eclectic counseling in many different settings based on this integrated model. *Prep. 53.803, 53.804, Counseling Theory and Process I and II or permission of instructor.*

### **53.835 Psychodiagnostic Measures**

An advanced level course in the use and interpretation of interest and personality measures for more clinically oriented settings. The course will place heavy emphasis on the case study method. Some of the tests typically studied in this course may include the Minnesota Multiphasic Personality Inventory, the California Psychological Inventory, Edwards Personal Preference Schedule, the Semantic Differential, and various interest measures. The course will introduce the student to projective techniques beginning with the sentence completion test. *Prep. 53.801 Tests and Test Procedures; Abnormal Psychology or Personality Theory; and permission of instructor.*

### **53.836 Systems Approach to the Development of Counseling and Guidance Services**

Concepts of systems analysis will be applied to the development, management, and delivery of counseling and guidance services. Students will be taught the skills of analysis and synthesis of problems, the writing of behavioral objectives, and the design of flowcharts. These skills will be applied to problems of the student's choosing. Consideration will be given to the underlying concept of this approach as well as to its limitations in relation to other approaches to human services problems.

### **53.840, 53.841 Field Work Specialization**

(8 quarter hours)

Required of all CAGS students. The student will be assigned a field work placement consistent with both his major professional goal (counseling or consulting/coordinating) and the setting in which he intends to work (school, college, or community setting). The activity of the field work will extend across the academic

year from September to June and require a minimum of four hours a week in the field work setting. Seminars will meet on alternate weeks with additional individual supervision on campus. Supervision will also be provided in the field setting.

Students must be enrolled in this course sequence before they will be permitted to take the qualifying examination given in the spring. Both quarters must be completed before credit will be given for the course. *Prep. Counseling Practicum or the equivalent in experience.*

## READING

### **54.800 Introduction to Reading and Language Skills**

Introductory course in language skills for noncertified candidates. Overview of the growth areas in reading: a) word recognition; b) meanings; c) study skills. Integrating reading and all the language skills in lesson planning. Review of some materials commonly used in school reading programs.

### **54.801 Foundations of Reading**

Initial course in the Reading specialization sequence designed for certified teachers. Covers reading programs, their approaches, materials, grouping, and planning integrated lessons in a developmental program. The structure of language and the normal reading process will be discussed.

### **54.802 Reading Disability**

First course in the causes of reading failures, including physical causes, psychological causes, and environmental factors. A review of selected research bearing on reading disability, and a review of some of the programs set up for disabled readers, including some of the methods and materials available for diagnosis and correction. *Prep. 54.800 Introduction to Reading and Language Skills or 54.801 Foundations of Reading.*

### **54.804 Reading Clinic I—Diagnosis and Correction** (6 quarter hours)

First of two-quarter clinical experience which will include intensive diagnostic and corrective measures with students enrolled in the Clinic. Basic diagnostic tools and instruments will be studied and used and evaluated. Corrective programs built on these diagnostic findings will be incorporated into a detailed log for each student taught in the Clinic. Staff will supervise and provide small group seminars in addition to the lecture session. The emphasis in the first clinical experience will be on a one-to-one basis. Teams of graduate students will consult with each other and with the Clinic supervisor for each case. *Prep. 54.802 Reading Disability and 54.811 Materials Workshop in Reading.*

### **54.805 Reading Clinic II—Diagnosis and Correction** (6 quarter hours)

The continued development of sophistication in the use and evaluation of diagnostic and corrective instruments and programs. In this quarter the clinical experience will be with small groups of disabled readers under the supervision of the staff. Seminars in the clinic will deal with problems attacked by teams of graduate students and the staff. A detailed log of diagnostic and corrective work will be produced for the group taught by each graduate student. *Prep. 54.804 Reading Clinic I.*

**54.808 Teaching Reading at Junior and Senior High School Levels**

Intended to prepare the reading specialist for the upper levels. Includes an analysis of the reasons for upper level reading programs. Methods for teaching the reading skills used in exposition, argumentation and imaginative literature read at higher levels. Study skills used in the content fields are explained. Formal diagnostic reading tests and informal reading inventories are studied and appraised. Analysis of published materials and development of original instructional materials. Factors involved in rate of reading and the methods and materials used to increase speed of reading. Organization and administration of ongoing reading programs observed and reported. *Prep. 54.800 Introduction to Reading and Language Skills or 54.801 Foundations of Reading or permission of instructor.*

**54.809 Supervision and Administration of Reading Programs**

For those students who plan to serve as reading coordinators for school systems, as reading supervisors, or as directors of government-sponsored projects, and for school principals. Content will include the nature of supervision (at various levels and types of school or projects): administering programs, budgeting, scheduling, community relations, curriculum concerns, and other central issues. Students will have the opportunity to assist in supervising in the Clinic and elsewhere. *Prep. 54.805 Reading Clinic II.*

**54.810 Advanced Clinical Procedures**

Intended for students who wish to develop skills needed for work as clinicians. Students will use and evaluate new instruments for predicting reading problems and for diagnosing the causes of reading problems, including the ITPA. Newly developed corrective procedures will be evaluated. In-depth study of selected theories of learning disability will be examined. Prior work with WISC, WAIS or Binet is recommended. *Prep. Permission of instructor.*

**54.811 Materials Workshop in Reading**

The basic course in literature for children, adolescents, and adults. Thorough study of materials available and suggested methods of incorporating these into the total reading and language skills programs. After an overview of materials available, students will develop projects related to their own needs and interests. *Prep. 54.800 Introduction to Reading and Language Skills or 54.801 Foundations of Reading (may be taken concurrently).*

**54.812 Innovation in Reading**

Designed for advanced students who are concerned with development of reading curricula and materials. A review of some curricular innovations in reading, their strengths, weaknesses, and accomplishments. The majority of time in this seminar will be devoted to the development of original materials for various levels and for various types of students. Original plans for materials and skills or curricular innovation for advantaged or disadvantaged students may be developed. Work produced in the seminar will be tested, reworked, and, as feasible, published for wider distribution. *Prep. Permission of instructor.*

**54.813 Methods and Materials in Adult Literacy Education**

This introductory course includes a review of current ABE programs around the country with particular emphasis on the programs in Boston, e.g., OIC (Opportunities Industrialization Center), New Urban League, WIN (Work Incentive

Program), and public school programs for adults. This review of the programs will include a study and some observation of ongoing programs in the area, especially the two WIN programs presently being run by Northeastern. Specifically, students will discuss, observe, and study various approaches to ABE programs in terms of curriculum, methodology, materials used, grouping and evaluation.

A major objective of the course will be to become more aware of the psychological problems of adult readers and nonreaders. Adult behavior and learning will be studied; the effects on learning of particular environmental forces (e.g., black ghetto, Indian reservation, rural-urban factors, etc.); methods of teaching adults, at various levels, will be studied and observed, as will a wide range of currently available books and materials for adult programs. All students may do some supervised clinical work with adults in the Reading and Learning Clinic; logs will be kept on the diagnostic and corrective work developed for each student.

#### **54.814 English As a Second Language**

The major emphasis in this course will be on Spanish-speaking persons, although many of the principles are applicable to any non-English speaking population. An overview linguistically and psychosocially of the particular person, problems and programs locally and nationally for those persons for whom English is not the native language. The overview will include a study and live observation of ESL programs in the immediate vicinity of Boston as well as careful study of the linguistic aspects of the two languages involved; the psychological dimensions of the problem of the non-English speaker and reader; the nature of instructional materials available for teaching; the nature and structure of current programs locally and nationally; methods of diagnosing, grouping and evaluating progress in ESL programs.

The student, his language and culture, his current problems, and the new language and culture and its problem will be the constant focus of this course. Observations of local ESL programs, plus some possible clinical work under supervision, will be included in this course.

#### **54.891 Thesis**

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

#### **54.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

## **REHABILITATION ADMINISTRATION AND SPECIAL EDUCATION**

### *Rehabilitation Administration*

#### **50.950 Introduction to Rehabilitation**

An overview of and orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on coordinating and integrating services as they relate to the field of rehabilitation as a community process.

**50.951 Principles of Medical Rehabilitation**

The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Basic principles of medical rehabilitation important for the administrator to know will be presented. Psychological aspects of disability will also be discussed.

**50.952 Vocational Rehabilitation and Social Services**

The use of vocational rehabilitation as an effective rehabilitation process in Federal, state, and private agencies as supported and encouraged by the most recent Social and Rehabilitation Services legislation. This will include use of the rehabilitation model in programs for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and other special community programs. There will be emphasis on the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitative programs.

**50.953 Organization and Administrative Theory**

The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision-making, and communication in and between organizations. An organizational analysis will be made of all the different types of rehabilitation settings currently in use.

**50.956 Community Planning in Rehabilitation**

What the administrator needs to know about community planning to plan a program in his area. Basic principles of community planning, community organization, and community dynamics, as well as interdisciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies and the referral process among these agencies will be studied.

**50.957 Federal-State Relations in Rehabilitation**

The complex network of Federal-state relations and their implications for rehabilitation. Grant procedures, matching formulas, public relations and VRA directives, state and Federal legislation pertinent to rehabilitation.

**50.958 Social Welfare and Rehabilitation**

Acquainting rehabilitation administrators with the broad field of social welfare. The course will review the historical backgrounds of the relationship between vocational rehabilitation and social welfare and the more recent fast-moving developments in the relationship of these fields.

**50.959 Rehabilitation Research**

The emphasis in this course will be on administrative research, program evaluation, grantsmanship, etc. In addition, students will have the opportunity to develop a research design on some aspect of Rehabilitation Administration and carry out the necessary research operations involved.

**50.960 Practicum in Rehabilitation Administration**

Students will be assigned to a variety of rehabilitation agencies for their practicum experience. Problem-solving relevant to experiences encountered in internship.



**50.961 Rehabilitation Administration I**

An in-depth study of management practices within a rehabilitation organization from a behavioral stand-point. Areas to be covered include need surveys, goal setting practices, job descriptions, recruitment, staffing, training, professional development, caseload management, program planning, utilization of research, community relations, leadership patterns, performance appraisal and external relationships. Special cases will be used in classroom exercises.

**50.962 Administration of a Sheltered Workshop**

Special problems of administering a sheltered workshop, such as community planning, work evaluation, job-training, labor relations, contracting, production, and occupational placement.

**50.963 Rehabilitation Administration II**

Understanding the fiscal management of the typical rehabilitation setting including basic rehabilitation agency accounting, planned program budgeting, disbursements, cost-analysis, contracting, taxation, forecasting and funding. The implication of data processing for fiscal management will be covered in the course. Special problems will be assigned during the course.

**50.964 Rehabilitation and the Law**

This course is designed to sensitize rehabilitation administrators to the impact of legislative developments upon the field of rehabilitation. Special emphasis will be placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments.

**50.965 Occupational Placement**

A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view toward the handicapped will be discussed and analyzed, and more effective placement practices will be developed.

**50.991 Thesis**

A research activity that may be elected by the student in lieu of two electives (8 quarter hours), with the approval and recommendation of the adviser.

**50.999 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

*Speech Pathology and Audiology***55.803 Cerebral Palsy**

Neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological deviations, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child and adult with emphasis on a multidisciplinary approach.

**55.804 Aphasia and Related Neurological Disturbances**

Emphasis on clinical analysis of aphasic verbal behavior, physiology and pathology of aphasia, review of literature, and a brief review of current attitudes concerning therapy.

**55.805 Disorders of Voice**

Physiology and neurology of the laryngeal mechanism; the laryngoscopic examination. Voice disorders as learned behavior as a result of organic, neurological, and psychological deviation. Evaluation, referral, and management.

**55.806 Language Disturbances in Children**

Minimal cerebral dysfunction and its effect on language acquisition and use in the communicatively disturbed child; behavioral patterns of the nonverbal child; concepts of delayed development of language; evaluation and management.

**55.811 Stuttering**

Contemporary research in the field of stuttering. Elaboration of theories and their related therapies. Psychodynamics of stuttering behavior and empirical problems.

**55.812 Differential Diagnosis in Speech and Language Pathology**

Evaluation, interpretation, and integration of test results; the application of standard psychological tests to speech and hearing disorders; analysis of patients' premorbid and morbid histories, medical and psychological diagnoses; design and execution of therapeutic procedures; proper referral techniques and report writing; practicum situation. *Prep. 55.816 Test Procedures in Speech and Language or permission of instructor.*

**55.813 Advanced Clinical Practice**

Supervised clinical practicum in speech pathology and audiology in the Northeastern University Speech and Hearing Clinic and medical settings, educational settings, and rehabilitation centers. A minimum of 150 clock hours of experience with patients is required, to extend over a three quarter time period. An "I" grade will be awarded until all the requirements are met and then a pass-fail grade will be awarded. *Prep. 50 clock hours of clinical experience and permission of the clinical staff.*

**55.814 Clinical Audiometry I**

The use of pure tone and speech reception instrumentation and hearing aid evaluation, the results and interpretation in the diagnosis of functional and organic disorders. Prerequisites: Introduction to Audiology and consent of instructor. Lectures, demonstration, observations, and practicum.

**55.815 Clinical Audiology**

The process of identification and evaluation of hearing loss. Differential diagnosis. Tests for conductive, sensorineural, and retrocochlear involvements. A consideration of research findings in the area of hearing aid selection, auditory training, lip reading, and language training for hearing handicapped individuals. Prerequisites: Introduction to Audiology (see undergraduate Education catalog).



**55.816 Test Procedures in Speech and Language**

Procedures in evaluating organic and functional communication disorders using standard and nonstandard speech and language tests in University clinic situations. Demonstration and application of techniques, and objective reporting.

**55.817 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism**

Lectures and demonstrations by medical personnel. Emphasis on the head and neck. Admission by consent of adviser and medical supervisor. Prerequisites: Anatomy, Neurology, and Physiology of Speech and Hearing I; Introduction to Audiology, and Pathologies of the Ear. For advanced standing students.

**55.818 Pathologies of the Ear**

Lectures and observations in the organic and neurological pathologies of the ear; i.e., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment (medical setting).

**55.819 Clinical Audiometry II**

Specialized techniques (Beckesy, FGSR, EEG, Group Testing, and screening) the results and interpretation in the diagnosis of functional and organic hearing disorders. Prerequisites: Introduction to Audiology and Audiometry I. Lectures, demonstration, observations, and practicum.

**55.820 Physiological Acoustics**

A study of the human ear as an acoustical, mechanical, and electrical system. Psychophysical dimensions, calibrating procedures, methodologies of standardization and quantification of auditory response.

**55.821 Seminar in Audiology**

The audiology department at the Massachusetts Eye and Ear Infirmary selects interesting audiological problem patients and brings them to the Infirmary for presentation to, and the scrutiny of, students. The medical and audiological staffs of the Eye and Ear Infirmary are in charge of this seminar. Covered are: clinical history, findings, diagnosis, and disposition of each patient. At each session, two or three patients are presented and discussed in detail. Prerequisite: Pathologies of the Ear and permission of program director.

**55.822 Functional and Organic Disorders of Speech**

Diagnosis, prognosis, and remediation of articulatory disorders as learned behavior, as a result of organic and/or psychological deviation. Evaluation, referral, and management. Prerequisites: Anatomy I, Organic Disorders, and graduate standing.

**55.823 Social Aspects of Communication Disorders**

Effect of communication disorders on social functioning; the impact on child and family; sociological significance for parents; helping the family; kinds of help needed by family. Similarities and differences in services offered by the social caseworker, school, guidance counselor, vocational counselor, clinical psychologist, and the psychiatrist.

**55.824 Seminar in Speech Pathology**

A consideration of communication disorders of all types from a psychiatric viewpoint. A presentation of cases by the psychiatric and psychological staff. Differential diagnosis, etiology, symptomatology, and management.

### **55.860 Aphasia Rehabilitation**

Emphasis on current attitudes toward therapy and new methods, clinical methods of evaluation which are preparatory to therapy, observation of therapeutic methods, and supervised clinical practice at the Veterans Administration Hospital. *Prep. 55.804 Seminar: Aphasia and Related Neurological Disturbances or an acceptable equivalent.*

### **55.861 Neuropathology**

The intricacies of neurological disease. Application of functional neuroanatomy in comprehending the various disease processes involving the nervous system. Derangements of speech with a neurological basis, an understanding of the disease process in relation to the diagnosis and treatment of patients with neurological diseases: cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. Case presentations, neuroanatomy, laboratory experience, and analysis in the hospital environment. *Prep. Permission of instructor.*

### **55.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

## *Teaching the Deaf*

### **55.825 Teaching Speech to Deaf Children**

Utilization of vibration, visual aids, kinesthetic and proprioceptive cues, residual hearing and imitation in combination to elicit intelligible speech from the deaf.

### **55.826 Teaching Language and Reading to Deaf Children**

Modern methods in use such as the Fitzgerald Key and the Natural Language Approach. Emphasis on how to use language in natural situations through lip reading and writing, with later emphasis on the formal presentation of language principles.

Methods used to develop reading experiences that focus on content rather than mechanics. Development of a balanced reading program that will provide adequate motivation, provision for evaluation, a wide variety of rich materials, and a well-organized sequence of reading experiences.

### **55.827 Methods and Materials in Deaf Education**

Special methodologies in teaching the deaf. A wide view of the field and a comprehensive consideration of methods and materials. Emphasis placed on how to provide concrete experiences and activities, trips, and demonstrations to assist the child in understanding. There will also be demonstrations in the use of visual and auditory aids.

### **55.828 Aural Rehabilitation**

Various speechreading methods, auditory training techniques and materials. An integrated approach to the treatment of the hearing handicapped.

**55.852 Practicum: Teaching of the Deaf**

(8 quarter hours)

An opportunity for observing and teaching deaf children at various levels, under regular supervision in the Beverly School for the Deaf.

*Teaching the Emotionally Disturbed***55.807 Learning Disabilities**

Primary emphasis will be placed on the learning problems of children with perceptual-motor handicaps, i.e., children who meet the criteria of normal intelligence, academic retardation and diagnosable perceptual and behavioral differences as poor visual, auditory and tactile discrimination, motor incoordination, poor spatial orientation, figure-ground confusions, fragmented self-image, attention difficulties and hyperactivity.

Diagnostic tests currently used to evaluate these children and differentiate them from the overlapping groups of emotionally disturbed, mentally retarded, culturally deprived and physically handicapped will be reviewed.

A condensed survey will be made of the reading process, the skills involved, diagnostic and curriculum materials.

Methods and techniques now being developed for remediation of perceptual-motor handicaps will be discussed.

**55.830 Etiology, Dynamics, and Treatment of Emotional Disturbances in Children**

The etiology, dynamics, diagnosis and treatment of emotional disturbance in children. Special attention to emotional blocks to learning. The different kinds of referral agencies and their role in treatment.

**55.831 Teaching the Emotionally Disturbed: Problems and Strategies**

Identification of problem areas in teaching and learning. The development of materials and teaching methods as instructional strategies to meet specific learning difficulties.

**55.832 Group Dynamics**

Emphasis on understanding the deeper questions of group growth, behavior, and action fundamental to developing solutions to the complex problems of group life. Students will learn to act democratically and as a group, to examine their strengths and weaknesses, to make decisions, to become alert to new ideas and actions, to discover the pulse of a group, and why one group is productive while another is nonproductive. The group will examine intensively such areas as group process, sociodrama, sociometric techniques, attitude testing, social action project development, and communication blocks in human relations.

**55.833 Mental Health**

Conditions leading to the most effective social adjustment. The relationship between the maturation process and mental health, the predeterminants of maladjustment and its prevention, special stress on those factors that encourage the attainment of emotional maturity. Information bearing on mental health from the fields of psychiatry, psychology, sociology, physiology, and medicine will be synthesized and evaluated.

**55.834 Case Conferences on Emotionally Disturbed Children**

This course will be conducted in seminar style in connection with the student's practicum. Case presentations by outstanding resource persons will be thoroughly examined and discussed. Students will also be expected to make their case presentations to the seminar.

**55.835 Socio- and Psychodynamics of Family Life**

This course will cover internal and external dynamics of family life and the significance of such dynamic features to emotional disturbance in the child.

**55.836 Practicum in Special Education**

(8 quarter hours)

The culminating experience of this practicum will be participation as a teacher in a full quarter of student teaching fulfilling the requirement of the degree program. Preliminary experiences will include observation, individual tutoring, case studies, and attendance at staff conferences. Students should make application for the practicum to the director of the program two quarters prior to the intended quarter of the practicum.

**55.837 Seminar: Problems of the Emotionally Disturbed Child**

This course will be devoted to an intensive study of the special problems of the emotionally disturbed child. It will provide an opportunity to proceed in depth in any area of special interest to the seminar students. Thus special attention may be paid as warranted to such problems as the autistic child, the neurotic child, the child with character disorders, the child with psychosomatic disorders, or the multihandicapped child, such as the child with mental illness, mental deficiency, epilepsy.

**55.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

*Teaching the Mentally Retarded***55.801 Psychology of Exceptional Children**

A survey and introductory course. The nature and characteristics of exceptional children: gifted, mentally retarded, emotionally disturbed, physically handicapped, visually handicapped, deaf and hard of hearing, speech-handicapped, brain-injured, and language-impaired.

**55.840 Psychology of the Mentally Retarded**

The nature and needs of the mentally retarded; degrees of retardation, their etiologies and concomitant behavioral disorders. The Strauss syndrome. The concept of intelligence. Psychological rationale for curricula development. The importance of multidisciplinary approach in a program for the retarded child and his family.

**55.841 Methods and Materials — Trainable Retarded**

Curriculum development and education methodologies for the trainable retarded. Organization and development of instruction for pupils with retarded mental development in special classes.

**55.842 Methods and Materials — Educable Retarded**

Curriculum development and education methodologies for the educable retarded. Organization and development in instruction for pupils with retarded mental development in special classes.

**55.843 Industrial Arts and Crafts**

A course designed to develop some fundamental skills in teachers of mentally retarded children so that the latter may receive instruction in vocational and home economics. Projects in chosen areas such as sewing, food preparation, and making basic arts and crafts.

**55.844 Measurement and Evaluation in Special Education**

This course emphasizes the evaluation of intelligence and the assessment of psycholinguistic abilities and disabilities of the mentally retarded. Such instruments as the Illinois Test of Psycholinguistic Abilities and the Peabody Picture Vocabulary Test are discussed. Also considered are the methodologies used in the measurement of evaluation of retarded children.

**55.845 Rehabilitation for Special Education Teachers**

The purpose of this course is to help develop effective working relationships between vocational rehabilitation counselors and special education teachers. The course is designed to expose these two groups of professional workers jointly to a number of similar educational experiences. Also, designed for elementary and secondary personnel who are concerned with exceptional children. Topics covered: vocational rehabilitation terms and concepts; background of vocational rehabilitation, including present legislation; teacher's role in vocational rehabilitation; understanding of the counseling process; and vocational rehabilitation resources for special educators.

**55.846 Practicum in Special Education**

A combined course of teaching experiences with retarded children and experiences in performing differential diagnostic evaluations of retarded children in a clinical setting. Case analyses, staffings, program planning.

**55.847 Vocational Education for the Handicapped**

This course will be directed toward helping the special educator understand and utilize the potential of vocational education for the handicapped student. Special emphasis will be placed on the curriculum development in vocational education for the handicapped. Vocational education programs for the physically and mentally handicapped in junior high, secondary schools, post secondary schools, and adult education will be examined. Special attention will also be paid to the Vocational Education laws and amendments especially as they apply to the physically and mentally handicapped.

**55.870 Seminar in Special Education Administration**

A study of factors involved in surveying, planning, initiating, and administering a total special education program in public schools. This course should be taken toward the completion of the program in Special Education Administration as emphasis is placed on the application of knowledge gained in the previous courses. *Prep. 52.810, 52.811 Leadership in Education: Parts I and II, or permission of instructor.*

**55.891 Thesis**

A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

**55.899 Directed Study**

This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the department. Prerequisites: approval of the chairman of the department and of the Director of the Graduate School of Education.

Also other selected courses in Rehabilitation Administration, Deaf Education, and Speech Pathology.



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## UNDERGRADUATE COLLEGES

*Offering full-time day curricula on the Cooperative Plan leading to baccalaureate degrees*

Boston-Bouvé College

College of Business Administration

College of Criminal Justice

College of Education

College of Engineering

College of Liberal Arts

College of Nursing

College of Pharmacy and Allied  
Health Professions

*Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees*

Lincoln College

University College









northeastern university



graduate school of engineering  
1971-1972





northeastern university  
graduate school of engineering  
1971-1972

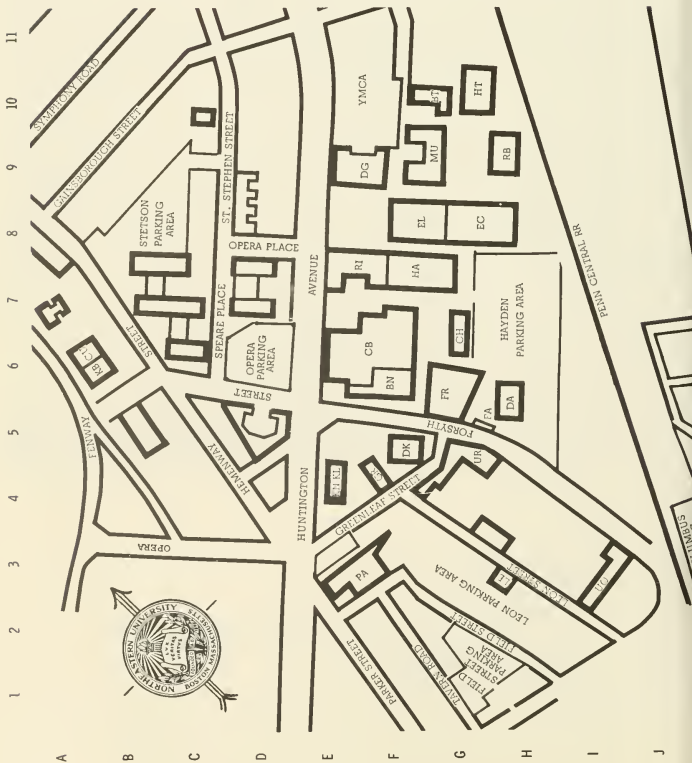


Northeastern University  
214 Hayden Hall  
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# MAP REFERENCE

MAP REFERENCE	Building	Building Designation
F6	Barletta Natatorium	BN
F10	Botolph Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Eli Student Center and Alumni Auditorium	EC
F8	Forsyth Building	EL
G6	Forsyth Building Annex	FR
G5	Forsyth Dental Building	FA
B5	Greenleaf Building	GR
F7	Hayden Hall	HA
G10	Hurtig Hall (Chemistry)	HT
B6	Kennedy Building	KB
E4	Knowles Center (Crim. Justice)	KN
E4	Knowles Center (Law)	KL
J3	11 Leon Street	UO
H3	40 Leon Street	LE
F9	Mugar Life Sciences Building	MU
F3	Parker Building	PA
E7	Richards Hall	RI
H9	Robinson Hall	RB
G5	United Realty Building	UR

## ACADEMIC CALENDAR 1971-1972

### Fall Quarter 1971

Registration period		
Burlington	Tuesday-Wednesday	Sept. 14-Sept. 15
Boston	Monday-Friday	Sept. 20-Sept. 24
Interview period for new students by appointment*	Tuesday-Friday	Sept. 14-Sept. 24
Classes begin	Monday	September 27
Last day to drop a course	Saturday	November 27
Examination period†	Monday-Friday	Dec. 13-Dec. 17

### Winter Quarter 1971-1972

Registration period		
Burlington	Tuesday-Wednesday	Nov. 30-Dec. 1
Boston	Monday-Friday	Dec. 6-Dec. 10
Interview period for new students by appointment*	Monday-Friday	Dec. 6-Dec. 10
Classes begin	Monday	Jan. 3
Last day to drop a course	Saturday	March 4
Examination period†	Monday-Friday	Mar. 20-Mar. 24

### Spring Quarter 1972

Registration period		
Burlington	Tuesday-Wednesday	Mar. 7-Mar. 8
Boston	Monday-Friday	Mar. 13-Mar. 17
Classes begin	Monday	April 3
Last day to file commencement card for spring commencement	Monday	April 3
Last day to pay fee for spring commencement	Monday	May 1
Last day to drop a course	Saturday	June 3
Final grades due in Registrar's Office for June graduates taking third quarter course	Friday	June 2
Examination period†	Monday-Friday	June 12-June 16
Spring commencement	Sunday	June 18

\*Appointments for interviews with new students must be made at least four days before the date of the interview.

†Examinations for day classes will be held in accordance with the undergraduate examination schedule.

### Summer Quarter 1972

Registration period		
Burlington	Monday-Tuesday	June 19-June 20
Boston	Wednesday-Friday	June 21-June 23
Interview period for new students by appointment	Monday-Friday	June 19-June 23
Classes begin	Monday	June 26
Last day to file a commencement card for fall commencement	Monday	July 3
Last day to drop a course	Friday	July 21
Examination period	Wednesday-Friday	Aug. 2-Aug. 4
Last day to pay fee for fall commencement	Tuesday	August 1

### UNIVERSITY HOLIDAYS 1971-1972

Columbus Day	Monday	October 11
Veterans' Day	Monday	October 25
Thanksgiving Recess	Thursday-Saturday	Nov. 25-Nov. 27
Christmas Vacation	Monday-Saturday	Dec. 20-Jan. 1
Washington's Birthday	Monday	February 21
Patriots' Day	Monday	April 17
Memorial Day	Monday	May 29
Independence Day	Tuesday	July 4
Labor Day	Monday	September 4

# the governing boards and officers of the university

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#### 1970-1971

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# the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); and the College of Criminal Justice (1967). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, the pharmaceutical sciences, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

## **GRADUATE AND PROFESSIONAL SCHOOLS**

The nine graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmaceutical Sciences offers the degree of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science.

### **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

### **RESEARCH ACTIVITIES**

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# buildings and facilities

## MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

## Eli Student Center

The Carl S. Eli Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

## Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and three divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, and Mathematics and Psychology. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 250,000 volumes supplemented by some 356,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 1,800 periodical titles, 90,000 documents, and 2,300 sound recordings.

### **Cabot Physical Education Center**

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouv  College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

### **Apartments for Graduate Students**

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A \$50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

## **SUBURBAN FACILITIES**

### **Suburban Campus**

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

### **Henderson House**

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

**Marine Science Institute**

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.



# regulations of the graduate school of engineering

The Master of Science degree may be earned in chemical engineering, civil engineering, electrical engineering, industrial engineering, mechanical engineering, and engineering management. In addition, there are programs leading to the Doctor of Philosophy degree in chemical engineering, civil engineering, electrical engineering, and mechanical engineering. The Doctor of Engineering degree is offered in chemical engineering. The Engineer degree may be earned in electrical engineering.

## GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

### Applications

All applicants for full-time study at the master's level should address inquiries to the respective departments or to the Graduate School of Engineering. Application forms and reference blanks will be mailed to the applicant. This material, together with the necessary transcripts, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language, required of all applicants whose native language is not English, should be returned to the Graduate School of Engineering Office as soon after January 15 as possible.

All applicants for part-time study at the master's level who wish to enroll in the Fall Quarter should request an application from the Graduate School of Engineering Office. The completed application and an official transcript should be mailed to the Graduate School of Engineer-



ing prior to August 15. The applicant will be notified by mail regarding his acceptance. Mail applications will not be accepted after August 15.

Applicants for part-time study after August 15, regardless of the academic term in which they plan to begin graduate study, must call the Graduate School of Engineering about two weeks prior to the interview period immediately preceding the term in which they desire to enroll to arrange for a personal interview. The dates of such interviews are announced in the catalogue (see academic calendar) and the circular issued in July.

In some cases, the Graduate Record Examination may be required of the applicants. The examination is administered by the Educational Testing Service, Box 955, Princeton, New Jersey, 08540. Applicants must make their own arrangements with the Educational Testing Service for the examination.

### **Transcripts**

Official transcripts of previous college training must be supplied with the mail application prior to August 15 if an admissions decision is to be rendered by return mail, or submitted at the personal interview after August 15. If this is not feasible, the official transcripts must be mailed to the Graduate School of Engineering as soon after the initial registration as possible. Failure to file the necessary transcripts will result in the student being asked to withdraw.

### **Admission**

To be admitted for graduate work, an applicant must have obtained a Bachelor of Science degree in engineering or a closely related science from a recognized college or university with an acceptable quality of undergraduate work. Acceptance to the school is granted upon recommendation of the departmental graduate committee or its designate following a review of the application and supporting material. The recommendation is based upon promise of academic success and fulfillment of minimum criteria established by each department in the Graduate School of Engineering.

Students with an engineering or related science bachelor's degree, who are enrolled in another graduate school at Northeastern, may transfer to the Graduate School of Engineering. However, they must make application and file the necessary documents, the same as transfers from other colleges or universities. The submission of registration materials for engineering course work does not constitute enrollment in the Graduate School of Engineering.



## **Registration**

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Auditors are not permitted. All students attending any course in the Graduate School of Engineering must be officially registered by the Registrar and listed on the class roster.

## **Residence**

All work for advanced degrees must be completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

## **Programs of Study**

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The Graduate School of Engineering issues a circular close to July 1st which gives the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level. The University reserves the right to cancel, postpone, combine, or modify any course.

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school.

## **Grading System**

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

**A Excellent**

This grade is given to those students whose performance in the course has been of very high graduate caliber.

**B Satisfactory**

This grade is given to those students whose performance in the course has been at a satisfactory level.

**C Fair**

This grade is given to those students whose performance in the course is not at the level expected in graduate work.

**F Failure**

This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

**I Incomplete**

This grade is given to those students who fail to complete the work of the course.

**S Satisfactory without quality designation.****U Unsatisfactory without quality designation.**

These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence. The designations S and U may also be used for thesis and seminar work.

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to make-up a final examination must obtain permission from the director of the graduate school by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the director to defer it to one of the next two quarters.

**Class Hours and Credits**

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar in the front of this catalog should be consulted for the opening and closing dates of each academic quarter.

### **Continuity of Program**

Students are expected to maintain continuous progress toward the degree. Any student who has not attended the Graduate School of Engineering for a period of one year must apply to the director for re-admission.

### **Withdrawals**

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the official withdrawal form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Registrar of their intention not to withdraw. Requests for withdrawal from a course after the ninth class meeting of the quarter may be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student.

### **Changes in Requirements**

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

### **Filing for the Degree**

Each student who plans to graduate either in June or September must submit to the Registrar's Office a completed commencement data card prior to the deadline listed in the academic calendar for that commencement at which he expects to receive the degree. If the deadline for filing is not met there is no assurance that the degree will be awarded that year. The commencement data card is supplied with the registration materials or is available in the Registrar's Office.

## **THE MASTER'S DEGREE**

### **Admission**

Specific requirements for each degree program will be found in the appropriate paragraphs for each academic department in the Graduate School of Engineering.

### **Academic Classifications**

Those students who have a Bachelor of Science degree from an accredited program with a high quality of previous work are classified as regular students.

Students whose records do not qualify them for enrollment as regular students may be accepted as provisional students if the quality of their undergraduate work is above the minimum required for acceptance to the Graduate School of Engineering. Provisional students must obtain a B average in the first 12 quarter hours of credit work to be reclassified as regular students and allowed to continue in the graduate program.

Those students who are not pursuing a specific degree program are classified as special students. No more than 12 quarter hours of credit earned as a special student may be counted toward the degree.

Any student whose record is not satisfactory may be dropped from the program regardless of his classification.

### **Academic Requirements**

A candidate for the master's degree must satisfactorily complete an approved program consisting of a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

To qualify for the Master of Science degree from the Graduate School of Engineering each student must have an average grade accumulative of not less than B with no more than 12 credits below a B in all courses undertaken at Northeastern University. The Committee on Graduate Study in Engineering allows eight quarter hours of credit to be taken in addition to the stated degree requirements to repeat failed required courses or to substitute for elective courses to obtain the required B average for completion of degree requirements. The number of I grades that a student may accrue will be limited.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

### **Comprehensive Examination**

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

**Thesis**

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the departmental graduate committee.

The thesis must receive a grade of B or better to be accepted. Instructions for the preparation of the thesis may be obtained from the department.

**Language Requirement**

An examination to show evidence of ability in one or more foreign languages may be required in some graduate programs. This knowledge is established by an examination arranged by the departmental graduate committee. This examination will be administered at least twice yearly.

**Transfer Credits**

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred are in the candidate's field, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at a recognized college or university, and have not been used toward any other degree. Students should petition the Graduate School of Engineering in writing for all transfer credits. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

**Time Limitations**

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the graduate school committee.

**Fellowships**

The departments of the Graduate School of Engineering have two types of fellowships available. Some departments have teaching assistantships and research fellowships for students enrolled in work leading to the master's degree. The departments which give doctoral degrees also have research fellowships for such students.

**Assistantships**

Some departments have teaching assistantships, on the Cooperative Plan, in which students alternate full-time academic work with full-time work in the department. Some departments also have available research fellowships. Applications for traineeships must be filed by March 15, with two letters of recommendation and a transcript of all prior college work. All students must have their course program approved by the chairman of the respective department before the student registers.

### Cooperative Programs

All the graduate departments offer full-time programs on the Cooperative Plan. This plan requires two academic years and a summer. During this time, each student has three twelve-week quarters of academic work and four twelve-week quarters of professional employment. The staff of the Department of Guidance and Placement of the Division of Cooperative Education will arrange for employment of cooperative graduate students. Applicants for this program must file two letters of recommendation and a copy of all prior college work as soon after January 15 as possible. The admissions committee will notify applicants as soon as their material is complete.

Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

In some departments, all of the students start their academic work in the fall quarter and are classed as Division A students. Some departments have one group of students starting their academic work in the fall quarter and one group of students starting their academic work in the winter quarter. In this case, the first group of students is classed as Division A and the second group of students is classed as Division B. The relationship of the first academic quarter for students in the respective divisions and the Fall, Winter, and Spring academic quarters is explained in the following chart:

#### DIVISION A

Academic Year	First Academic Quarter	Second Academic Quarter
First	Fall Quarter	Spring Quarter
Second	Winter Quarter	— — — — —

#### DIVISION B

Academic Year	First Academic Quarter	Second Academic Quarter
First	Winter Quarter	— — — — —
Second	Fall Quarter	Spring Quarter

Normally, the Cooperative Plan operates as shown above. Economic conditions, the military draft, and other factors may cause a departure from the normal plan. Interested applicants may obtain, when they apply for admission, information from the department about any modification of the academic year.

### **Full-Time Program**

All the departments offer a continuous full-time program in which the requirements for the master's degree can be completed in one academic year.

### **Part-Time Program**

Most of the departments offer part-time programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time programs are specified by the departments. All part-time students must register in those areas which are posted outside of the Registrar's Office or at the Suburban Campus at the times designated by the academic calendar. An official transcript of prior college work must be submitted with the mail application prior to August 15 or at the personal interview for those who apply after August 15.

### **Honorary Societies**

Northeastern University has chapters of Tau Beta Pi, Sigma Xi, and Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

## **THE DOCTOR OF PHILOSOPHY DEGREE**

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

### **Admission**

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

### **Classification and Degree Candidacy**

Students taking advanced graduate work are classified as follows:

1. **Doctoral Student**

Students in this classification have been admitted to a doctoral program.



**2. Doctoral Degree Candidate**

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

**3. Special Students**

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

**Residence Requirement**

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

**Qualifying Examination**

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

**Comprehensive Examination**

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

**Course Requirements**

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

**Dissertation**

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.



### **Language Requirement**

The foreign language requirement and how it is satisfied is established by the committee in charge of each degree program.

### **Final Oral Examination**

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

### **Transfer Credit**

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

### **Time Limitation**

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

### **Registration**

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

## **THE DOCTOR OF ENGINEERING DEGREE**

The Doctor of Engineering degree is awarded to candidates who give evidence of high attainment and ability in their major field. The degree

requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

### **Admission**

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

### **Classification and Degree Candidacy**

Students taking advanced graduate work are classified as follows:

1. Doctoral Student

Students in this classification have been admitted to the doctoral program.

2. Doctoral Degree Candidate

Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.

3. Special Students

This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

### **Residence Requirement**

Candidates for the Doctor of Engineering degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

### **Qualifying Examination**

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

### **Comprehensive Examination**

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in this field.

**Course Requirements**

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are doctoral course requirements, and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

**Dissertation**

The dissertation for the Doctor of Engineering degree is fundamentally different from that of the Doctor of Philosophy degree. In general, the latter focuses on contributions to new knowledge in the engineering sciences and is expected to demonstrate the student's competence as a researcher. The dissertation for the Doctor of Engineering degree focuses on creative engineering design and in-depth engineering studies. It may, and usually will, contain elements that involve research, but above all, it must demonstrate the student's ability to work creatively on engineering analysis and design problems such as those encountered in professional practice.

**Language Requirement**

There is no foreign language requirement, but, in lieu of such a requirement, the student must demonstrate proficiency in computer software techniques and an acceptable machine language.

**Final Oral Examination**

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

**Transfer Credit**

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

**Time Limitation**

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of

the committee of his degree program, petition the Committee on Doctoral Degree Programs or the University Graduate Council for such extension.

### **Registration**

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

### **Professional Experience**

The student is required to present evidence of at least one calendar year of experience in engineering practice at a suitable professional level. This experience must have been acquired after completion of a bachelor's degree in a branch of engineering. The committee in charge of each degree program specifies the details of the professional experience requirement.

## **INTERDISCIPLINARY PROGRAMS**

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

### **Admission**

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

### **Formation of Interdisciplinary Committee**

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the director of the graduate school of the membership of the committee as soon as arrangements are complete.

### **Duties of Interdisciplinary Committee**

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

## **THE ENGINEER DEGREE**

The degree of Engineer is intended for those who do not wish to make a commitment to post master's degree graduate study that is as extensive as that required for one of the doctor's degrees. It is an intermediate degree, between master's and doctor's degrees. A student who has completed the Engineer degree is eligible to apply for admission to a doctor's degree program.

**Admission**

Each departmental Engineer degree program has its own admission procedure for students beginning the program. Normally a master's degree in engineering or related field is required. Initial contact should be with the chairman of the appropriate department.

**Classification and Degree Candidacy**

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

**Residence Requirement**

Candidates for the Engineer degree must spend the equivalent of at least two academic quarters in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

**Qualifying and Comprehensive Examinations**

The committee for each Engineer degree program specifies its own examinations. Normally, no qualifying examination is required for candidacy and no comprehensive examination is required for completion, but individual departments offering the degree may require such examinations.

**Course Requirements**

The minimum course requirement will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40 allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in the department in which the degree is offered. Specific course requirements for each Engineer degree program are determined by the departmental committee in charge of the program.

**Dissertation**

Each Engineer degree student must complete a dissertation which demonstrates a high level of competence in engineering research, development, or design. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate course work.

**Language Requirement**

No foreign language is required for the Engineer degree.

**Final Oral Examination**

A final oral examination may be required by the departmental committee in charge of the Engineer degree program. The examination will normally consist of a defense of the dissertation.

**Transfer of Credit**

Approval for transfer of credit must be given by the departmental committee in charge of the degree program.

**Time Limitation**

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental committee in charge of the degree program.

**Registration**

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.





# financial information

## FINANCIAL OBLIGATIONS

### Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Tuition for full-time doctoral degree candidates is \$600 per quarter of registration. For doctoral candidates registered for work performed off campus on the Ph.D. dissertation, the charge per quarter is \$200. For doctoral degree candidates who are no longer actively utilizing the resources of the university there is a continuation charge of \$50 per quarter with the exception of the summer quarter.

Tuition for all other students is \$51.00 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar's Office and are payable by cash or check to Northeastern University on or before the date specified.

### Fees

A registration fee of \$15 is charged all students when they register for the first time in the graduate school at Northeastern University.

Other fees include a charge of \$10 for late payment of tuition and a commencement fee of \$25 for all degree candidates, payable before commencement.

For full-time students there is a charge of \$12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is \$6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged 75 cents a quarter.

All full-time students pay a non-refundable University Health Service fee of \$75 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the students to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged by graduation.

## Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Amount of Refund:	
Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

## FINANCIAL AID

Northeastern University has available the following types of assistantships and fellowships for support of graduate students. Those interested in financial aid must apply through the chairman of the major department. The chairmen or representatives of the Department are listed in the catalog under the Committee on Graduate Study in Engineering.

### Teaching Assistantships

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

### Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with non-teaching, administrative duties.

### Northeastern Fellowships

Many departments provide remission of tuition for students who share in the administrative work of the department. These awards are normally given to full-time students in the first year of graduate work.

### Research Fellowships

A number of departments offer research fellowships including N.I.H., N.S.F., and N.D.E.A. carrying a stipend and remitting tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for thesis or dissertation.

### **Martin Luther King, Jr. Scholarships**

These scholarships provide for remission of tuition and all fees and are awarded to qualified full- and part-time black students on the basis of financial need.

### **Doctoral Research Fellowships**

In the departments which give work leading to the Ph.D. degree, research fellowships available for students who have established candidacy for the Ph.D. degree carry a higher stipend than fellowships at the master's level.

### **Appointments**

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisers and the director of the graduate school.

### **Dormitory Proctorships**

A number of proctorships in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

### **National Defense Student Loan Program**

Under the provisions of an act of the federal government, students carrying an academic load of one-half or more are entitled to loans up to \$2500 for one school year and up to a total of \$10,000 for undergraduate and graduate work. The actual amount of any award will be determined on the basis of need and academic promise.

The repayment period begins nine months after the borrower ceases to carry a half-time load and extends ten years from that point. Cancellation of up to 50 per cent of national defense loans including interest is allowed for graduates who enter the field of teaching. Up to 100 per cent may be cancelled for service in certain areas. Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students. For other students the deadline is one month prior to the start of the quarter for which aid is requested.

**Higher Education Loan Plan**

Educational assistance loans may be available from certain banks in the student's home town. These loans, guaranteed by state agencies, carry an interest charge of seven per cent, three per cent of which is paid by the federal government. Graduate students may borrow up to \$1,500 for each year of study up to a maximum of \$7,500 for both undergraduate and graduate work. Monthly repayment begins nine to twelve months after completion of study and extends up to five years.

# faculty

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 David R. Heiman, B.S., M.S., *Lecturer in Engineering*  
 Robert S. Hilbert, B.S., M.S., *Lecturer in Engineering*  
 Mitchell O. Hoening, B.S., *Lecturer in Engineering*  
 Stewart V. Hoover, B.S., M.S., *Assistant Professor of Industrial Engineering*  
 Dennis R. Horn, B.S., M.S., *Assistant Professor of Civil Engineering*  
 Richard E. Howard, B.S., *Lecturer in Engineering*  
 Howard J. Huemmler, B.S., M.S., *Lecturer in Engineering*  
 Thomas E. Hulbert, B.M.E., M.S., *Associate Professor of Industrial Engineering*  
 Walter E. Jaworski, B.S., M.S., *Assistant Professor of Civil Engineering*  
 Paul M. Kalaghan, A.B., M.S., *Lecturer in Engineering*  
 Gideon Kantor, B.E.E., M.E.E., Ph.D., *Lecturer in Engineering*  
 David L. Katz, B.S., M.B.A., *Lecturer in Engineering*  
 Wayne G. Kellner, B.S., M.S., Sc.D., *Associate Professor of Electrical Engineering*  
 Dennis Kelsall, B.S., Ph.D., *Lecturer in Engineering*  
 McKeen Kessel, B.S., *Lecturer in Engineering*  
 Rajinder K. Khetarpal, B.S., M.S., Ph.D., *Assistant Professor of Civil Engineering*  
 Kenneth H. Konkle, B.S., M.S., *Lecturer in Engineering*  
 John D. R. Kramer, Jr., B.S., S.M., Sc.D., *Lecturer in Engineering*  
 Uve Lammers, Dip. Ing., Doctor Ing., *Lecturer in Engineering*  
 Jack Larsen, AB., M.A., LL.B., LL.M., *Lecturer in Engineering*  
 Don A. Lautman, B.S., Ph.D., *Associate Professor of Mechanical Engineering*  
 Kenneth M. Leet, B.S., M.S., D.Sc., *Associate Professor of Civil Engineering*  
 Thomas LeFeuvre, B.S., Ph.D., *Lecturer in Engineering*  
 Joseph H. Lenney, B.S., M.S., *Associate Professor of Civil Engineering*  
 Edward M. Lenoe, A.B., B.S., M.S., D.E.S., *Lecturer in Engineering*  
 Edward F. Levell, B.S., M.S., *Lecturer in Engineering*  
 Walter H. Lob, B.S., M.S., *Associate Professor of Electrical Engineering*  
 Morton Loewenthal, B.S., Ph.D., *Associate Professor of Electrical Engineering*  
 Robert F. London, A.B., M.B.A., *Lecturer in Engineering*  
 Bertram S. Long, B.S., M.S., M.E., *Associate Professor of Mechanical Engineering*  
 John D. Macey, B.S., M.S., *Lecturer in Engineering*  
 Frederick M. MacGregor, Jr., B.S., *Lecturer in Engineering*  
 Pasquale A. Marino, B.S., M.S., Ph.D., *Lecturer in Engineering*  
 Robert N. Martin, B.S., M.S., *Associate Professor of Electrical Engineering*  
 Stuart L. Mathison, B.Eng. Phy., M.S., *Lecturer in Engineering*  
 Robert E. Maurer, B.S., M.S., Ph.D., *Lecturer in Engineering*  
 Francis D. McCarthy, B.E., M.E.E., Ph.D., *Assistant Professor of Electrical Engineering*  
 Alan J. McLaughlin, B.S., M.S., *Lecturer in Engineering*  
 John D. McLellan, B.A., *Lecturer in Engineering*  
 Demosthenes Menegakis, B.S., M.S., *Lecturer in Engineering*  
 Robert L. Meserve, B.S., M.S., *Associate Professor of Civil Engineering*  
 Ernest E. Mills, B.S., M.S., *Associate Professor of Mechanical Engineering*  
 Henry T. Minden, B.A., Ph.D., *Lecturer in Engineering*  
 Harold K. Mintz, B.S., M.S., *Lecturer in Engineering*

- James W. Modestino, B.S., M.S., M.A., Ph.D., *Assistant Professor of Electrical Engineering*
- James M. Moore, B.S., M.S., Ph.D., *Professor of Industrial Engineering and Chairman of the Department*
- John A. Moyne, B.S., M.S., Ph.D., *Lecturer in Engineering*
- James D. Murphy, B.S., *Lecturer in Engineering*
- Richard J. Murphy, B.S., M.S., Ph.D., *Associate Professor of Mechanical Engineering*
- Saul Namyet, B.S., *Associate Professor of Civil Engineering*
- Thomas L. Neff, B.S., M.S., *Assistant Professor of Civil Engineering*
- Warren G. Nelson, S.B., S.M., Sc.D., *Associate Professor of Mechanical Engineering*
- Ronald G. Newburgh, A.B., Ph.D., *Lecturer in Engineering*
- David D. Nickerson, A.B., M.B.A., *Lecturer in Engineering*
- Hiroshi H. Nishino, B.S., E.E., Ph.D., *Lecturer in Engineering*
- David W. Noones, B.S., M.S., *Lecturer in Engineering*
- Gerald A. Nordstrom, B.S., M.S., *Lecturer in Engineering*
- Welville B. Nowak, S.B., Ph.D., *Professor of Mechanical Engineering*
- Robert M. O'Brien, B.S., *Lecturer in Engineering*
- Paul J. Ossenbruggen, B.C.E., M.S., Ph.D., *Assistant Professor of Civil Engineering*
- Bernard Otterman, B.M.E., M.S., Ph.D., *Assistant Professor of Mechanical Engineering*
- Alex C. Papaioannou, B.S., M.S., *Lecturer in Engineering*
- Gerald S. Parker, B.S., M.S., *Lecturer in Engineering*
- Robert E. Parkin, B.S., Ph.D., *Assistant Professor of Electrical Engineering*
- Kenneth Paulin, B.S., M.S., *Lecturer in Engineering*
- Thomas E. Phalen, Jr., B.S., M.S., *Associate Professor of Mechanical Engineering*
- Robert P. Porter, B.S., M.S., Ph.D., *Lecturer in Engineering*
- C. Andrew Pretzer, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*
- John Proakis, B.S., M.S., Ph.D., *Associate Professor of Electrical Engineering*
- Benjamin M. Rabinovici, Ing. Dipl. E.E., M.S., D.Sc., *Professor of Electrical Engineering*
- Harold R. Raemer, B.S., M.S., Ph.D., *Professor of Electrical Engineering and Chairman of the Department*
- Charles F. Reeves, B.S., M.S., *Lecturer in Engineering*
- Wilfred J. Remillard, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
- George O. Reynolds, B.S., M.S., *Lecturer in Engineering*
- Howard H. Reynolds, A.B., Sc.D., *Lecturer in Engineering*
- Donald H. Rice, B.S., M.S., *Lecturer in Engineering*
- J. Spencer Rochefort, B.S., M.S., *Professor of Electrical Engineering*
- Walter M. Rowell, Jr., B.S., *Lecturer in Engineering*
- Irving Sacks, B.A., M.S., *Lecturer in Engineering*
- Gerald D. Saks, B.M.E., M.B.A., *Lecturer in Engineering*
- Sheldon S. Sandler, B.S., M.S., Ph.D., *Associate Professor of Electrical Engineering*
- Martin M. Santa, B.S., S.M., LL.B., *Lecturer in Engineering*
- Jayantilal K. Satia, B.S., M.S., Ph.D., *Assistant Professor of Industrial Engineering*
- Gerhard O. Sauermann, B.S., M.S., Ph.D., *Lecturer in Engineering*
- Martin Schetzen, B.E.E., S.M., Sc.D., *Professor of Electrical Engineering*
- John K. Schindler, S.B., M.S., Ph.D., *Lecturer in Engineering*
- Walter C. Schwab, S.B., S.M., Ph.D., *Professor of Electrical Engineering*
- William J. Scott, B.S., M.B.A., *Lecturer in Engineering*
- John A. Seegar, S.B., *Lecturer in Engineering*
- David A. Shnidman, B.S., M.S., Ph.D., *Lecturer in Engineering*
- Thomas J. Skinner, B.S., M.A., Ph.D., *Lecturer in Engineering*
- Sidney L. Smith, S.B., S.M., Ph.D., *Lecturer in Engineering*
- Robert M. Snow, B.S., M.S., *Lecturer in Engineering*
- Ernest L. Spencer, B.S., M.S., *Professor of Civil Engineering and Chairman of the Department*
- Stanley L. Spiegel, B.S., A.M., Ph.D., *Research Associate in Mathematics*
- Chester W. Stanhope, B.S., M.S., *Lecturer in Engineering*
- Richard R. Stewart, B.S., M.S., Ph.D., *Associate Professor of Chemical Engineering*
- Robert C. Stiefel, B.S., M.S., Ph.D., *Associate Professor of Civil Engineering*
- Robert D. Stuart, B.A., M.A., Ph.D., *Professor of Electrical Engineering*
- Raimundas Sukys, B.S., M.S., *Research Associate in Electrical Engineering*
- Robert W. Tarmy, B.S., M.S., Ph.D., *Lecturer in Engineering*
- Lloyd G. Thompson, B.A., M.S., Ph.D., *Lecturer in Engineering*

Kenneth E. Tiernan, B.E.E., M.S., Ph.D., *Lecturer in Engineering*  
Ralph A. Troupe, B.S., M.S., Ph.D., *Professor of Chemical Engineering and  
Chairman of the Department*  
Alexander Vanderburgh, Jr., B.S., M.S., *Lecturer in Engineering*  
Raoul F. van Lighten, M.S., *Lecturer in Engineering*  
Thomas Vasilos, B.S., Sc.D., *Lecturer in Engineering*  
George Wallis, M.S., Ph.D., *Lecturer in Engineering*  
David M. Waxman, B.S., M.S., *Lecturer in Engineering*  
Lih-Jyh Weng, B.S., M.S., Ph.D., *Assistant Professor of Electrical Engineering*  
Robert B. Wilcox, B.E., M.S., *Lecturer in Engineering*  
John A. Williams, B.S., M.S., Ph.D., *Assistant Professor of Chemical Engineering*  
Leslie E. Woods, *Lecturer in Engineering*  
Alvin J. Yorra, B.S., M.S., *Associate Professor of Mechanical Engineering*  
Joseph J. Zelinski, B.S., Ph.D., *Professor of Mechanical Engineering*  
John Zotos, B.S., M.S., Met.E., *Associate Professor of Mechanical Engineering*  
Joel L. Zuckerman, B.S., M.A., *Lecturer in Engineering*



# chemical engineering

## Admission

To be enrolled for graduate work in chemical engineering, applicants must have obtained a Bachelor of Science degree in chemical engineering, with an acceptable quality of undergraduate work, from a recognized college or university.

## THE MASTER'S DEGREE

### Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
4.802 Chemical Engineering Mathematics . . . . .	4	4.823 Transport Phenomena . . . . .	4
4.806 Optimization Techniques . . . . .	4	4.811 Chemical Engineering Thermodynamics .	4
4.829 Process Dynamics .	4	4.991 Thesis . . . . .	5
4.991 Thesis . . . . .	2		13
	14		
Third Academic Quarter	Credits		
4.890 Chemical Engineering Kinetics . . . . .	4		
4.973 Heat Transfer . . .	4		
or			
4.974 Fluid Mechanics . .	4		
4.991 Thesis . . . . .	5		
	13		

Additional course work may be substituted for the Master of Science thesis upon approval of the chairman of the department. The request for this substitution must be made at the time of acceptance to the graduate school.

Students may take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by the chairman of the department.

### **Electives**

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which give graduate work.

## **THE DOCTOR OF PHILOSOPHY DEGREE**

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

### **Admission**

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must submit an application for admission as a doctoral candidate and two letters of recommendation not later than April first. The applicant will be notified of the acceptance of his application and the date of the qualifying examination.

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the

latter case, a detailed time schedule must be approved by the departmental graduate committee as evidence that at least half of the time is being devoted to the requirements of the graduate school program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations.

### **Qualifying Examination**

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the written examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

### **Comprehensive Examination**

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

### **Course Requirements**

The course requirements in addition to the minimum requirements for establishing degree candidacy will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

### **Thesis**

An individual may choose his thesis topic and supervisor as soon as he becomes a doctoral student. In most cases selection of topic will be made immediately after the student has established his candidacy for

the Ph.D. degree. He will be expected to discuss with the staff their Ph.D. thesis topics offerings. After these discussions, the student shall notify the adviser, the department head, and the chairman of the departmental graduate committee in writing of his choice of thesis topic and adviser. The chairman of the departmental graduate committee after consultation with the thesis adviser shall appoint an appropriate thesis committee. This committee shall be kept informed of the progress of the thesis and will approve the thesis in its final form.

### **Language Requirement**

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German, and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

### **Final Oral Examination**

This examination is held in accordance with the general regulations of the graduate school.

## **THE DOCTOR OF ENGINEERING DEGREE**

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Doctor of Engineering degree. For further information, applicants should write to the Chairman of the Department of Chemical Engineering.

### **Admission**

Applicants for the Doctor of Engineering program must either be candidates for the Master of Science degree in Chemical Engineering or have completed the Master of Science program in chemical engineering.

Applicants need not have undertaken a master's thesis.

Applicants for the Doctor of Engineering degree must pass the doctorate qualifying examination given to applicants for the Doctor of Philosophy degree in this department.

Applicants must file application forms with the departmental graduate committee along with official transcripts of previous college work, and two letters of recommendation. Applicants will not be considered until all documents have been received. Applicants will be notified promptly as to whether or not they have been accepted.

### **Residence Requirement**

The residence requirement is satisfied only by full-time residence for one academic year. This requirement must be fulfilled after successful

completion of the qualifying examination and prior to the end of the five-year period set forth in the general regulations.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations.

### **Qualifying Examination**

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

### **Comprehensive Examination**

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

### **Course Requirements**

The course requirements, in addition to the minimum requirements for establishing degree candidacy, will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

### **Engineering Problem**

Engineering Problem advisers will be appointed by the departmental graduate committee. Approval of the topic for the Problem rests with the Problem adviser and the committee.

The Engineering Problem is not a research problem but rather an engineering problem in depth. It may include elements of design, economics, business management principles, and process development. In general, it will not include laboratory investigations.

Normally, the Engineering Problem will be solved on campus. Under special arrangements approved by the departmental graduate committee and the adviser, a portion of the work may be performed off campus.

Regardless of the arrangements made for the Engineering Problem, no off-campus adviser will be approved. Only the Problem adviser will specify the nature and requirements of the Problem, and the findings and results remain the property of the adviser and the University to be published as they determine.

### **Language Requirement**

There is no foreign language requirement for this degree.

### **Computer Ability**

Ability with computer programming must be demonstrated when required.

### **Final Oral Examination**

This examination is held in accordance with the general graduate school regulations.

## **DESCRIPTION OF COURSES**

*All courses carry four quarter hours of credit unless otherwise noted. Seminars and thesis may have varying credits established by the department at the time of registration.*

### **4.801 Advanced Chemical Engineering Calculations**

The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions. *Prep. Bachelor of Science degree in Chemical Engineering, including Differential Equations.*

### **4.802 Chemical Engineering Mathematics**

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses. *Prep. 10.147 Mathematical Analysis or equivalent. Offered yearly, fall quarter*

### **4.806 Optimization Techniques**

The mathematical foundations of indirect optimum seeking techniques are developed. Topics covered include necessary and sufficient conditions for maxima and minima, equality and inequality constraints, differential algorithms, geometric and linear programming. The application of these techniques is illustrated with problems of engineering interest. Direct optimum seeking techniques are developed for single and multivariable search problems. Topics covered include Fibonacci search, contour tangent elimination, gradient methods, and dynamic programming. *Prep. Bachelor of Science degree in Engineering or Science.*  
Offered yearly, fall quarter

**4.811 Chemical Engineering Thermodynamics**

A thermodynamic analysis of processes of interest to the chemical engineer. Thermodynamics is used as a tool and a method of approach to the solution of industrial problems. Fundamental principles are reviewed to the extent needed. *Prep. Undergraduate Chemical Engineering Thermodynamics.*

Offered yearly, spring quarter

**4.821 Corrosion Fundamentals (2 q.h. credits)**

Economic factors, basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. *Prep. Bachelor of Science degree.*

**4.823 Transport Phenomena**

A consideration of the relationships of mass, momentum, and energy transfer. Fundamental equations of change covering the transport of momentum, heat, and mass are developed to illustrate the essential unity of the transport processes. Molecular, microscopic, and macroscopic systems are studied. It will be seen that much of the theory behind the engineering calculations on which the unit operations of chemical engineering are based can be organized and integrated in terms of equations of change. *Prep. Advanced Mathematics and Unit Operations or equivalent.*

Offered yearly, spring quarter

**4.829 Chemical Process Dynamics and Control**

The Laplace transform. Mathematical modeling of unsteady state heat transfer, liquid level, and chemical reactor systems. Transient response of control systems with emphasis on regulator operation. Stability analysis by various methods. Obtaining frequency response from experimental dynamic data by the methods of harmonic, step, pulse, and random forcing. Distributed parameter systems. Discussion of papers from the literature. *Prep. Bachelor of Science degree.*

Offered yearly, fall quarter

**4.832 Chemical Data Estimation (2 q.h. credits)**

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses. *Prep. Bachelor of Science degree.*

**4.833 Research Techniques I**

The essential techniques of research including experimentation, mathematical modeling, data reduction, and graphical presentation techniques. For students in the non-research options (M.S. and D.Eng.). *Prep. Bachelor of Science degree and registration in non-thesis M.S. or D.Eng. program.* Offered yearly, all quarters

**4.834 Research Techniques II**

Continuation of 4.833. *Prep. 4.833.*

Offered yearly, all quarters

**4.890 Chemical Engineering Kinetics**

A review of the principles of reaction kinetics. Problems for solution similar to those encountered in the design and operation of reaction equipment are



selected to illustrate important principles. *Prep. Thermodynamics, undergraduate Chemical Engineering Kinetics or equivalent.* Offered yearly, winter quarter

#### **4.899 Special Topics in Chemical Engineering**

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. *Prep. Permission of department staff.*

Offered yearly, all quarters

#### **4.973 Heat Transfer**

Discussion of the mechanisms of heat transfer. Conduction in stationary systems. Free and forced convection in laminar and turbulent flow. Boiling and condensation. Heat exchangers. *Prep. Undergraduate Heat Transfer.*

Offered 1972-73, winter quarter

#### **4.974 Fluid Mechanics**

Discussion of statics, kinematics, and stress concepts associated with fluids. Formulation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. *Prep. Undergraduate Fluid Mechanics.*

Offered 1971-72, winter quarter

#### **4.990 Seminar**

Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prep. Admission to graduate program in chemical engineering.*

Offered yearly, all quarters

#### **4.991 Thesis (Master's Degree)**

Analytical and/or experimental work conducted under the supervision of the department. For master's degree requirement. *Prep. Admission to Master of Science program in chemical engineering.*

Offered yearly, all quarters

#### **4.995 Thesis (Ph.D. Degree)**

Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in chemical engineering.*

Offered yearly, all quarters



# civil engineering

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in civil engineering, with an acceptable quality of undergraduate work, from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

## THE MASTER'S DEGREE

### Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

A thesis carrying eight hours of credit is encouraged or a master's report carrying four hours of credit may be elected with the approval of the department.

Options in structural engineering and environmental engineering are available. The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

### STRUCTURAL ENGINEERING

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.847 Structural Analysis ..	4	1.856 Structural Analysis ..	4
1.858 Concrete Structures .	4	1.861 Design of Structures I	2
1.877 Eng. Props. of Soils .	4	1.878 Foundation Eng. ....	4
10.8A3 Advanced Math. ....	2	1.894 Numerical Methods in Structural Mechanics .....	4
		*1.897 Master's Report ....	4
		*1.899 Thesis .....	4
	14		(minimum) 14

\*By arrangement with the department in lieu of equivalent required course credits.

Third Academic Quarter		Credits
1.855	Concrete Structures III . . . . .	2
1.857	Structural Dynamics . . . . .	4
1.864	Design of Structures . . . . .	4
1.873	Soils Testing Lab. . . . .	2
*1.897	Masters' Report . . . . .	4
*1.899	Thesis . . . . .	4
		<hr/>
		(minimum) 12

### Full-Time Program

Arrangements may be made to complete the degree requirements in one year on a continuous full-time basis.

### Substitutions

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

### ENVIRONMENTAL ENGINEERING

First Academic Quarter		Credits	Second Academic Quarter		Credits
1.914	Water & Waste Treatment . . . . .	4	1.912	Water & Waste Treatment III . . . . .	2
1.923	Environmental Chemistry . . . . .	4	1.913	Industrial Waste . . . . .	2
1.933	Environmental Analysis . . . . .	4	1.992	Special Topics . . . . .	2
	Elective . . . . .	2		Electives . . . . .	8
		<hr/>			<hr/>
		14			14

Third Academic Quarter		Credits
1.922	Environmental Bacteriology . . . . .	2
1.993	Master's Report . . . . .	4
		or
**1.991	Thesis . . . . .	8
1.994	Seminar . . . . .	2
	Electives . . . . .	4
		<hr/>
		(minimum) 12

### Full-Time Program

Arrangements may be made to complete the degree requirements in one year on a continuous full-time basis.

\*By arrangement with the department in lieu of equivalent required course credits.

\*\*Thesis can be started prior to third quarter.

## Electives

The electives will normally be available according to the following schedule. Approved additional electives may be available from the graduate offerings in the departments of chemistry, biology, chemical engineering, and industrial engineering.

### FALL QUARTER

*1.905	Water Resources I .	2
**1.940	Public Health . . . . .	2
1.954	Stream Sanit. . . . .	2
1.991	Thesis . . . . .	8
1.992	Special Topics . . . . .	2
1.993	Master's Report . . . . .	4

### SPRING QUARTER

1.906	Water Resources II .	2
1.913	Ind. Waste . . . . .	2
1.938	Env. Anal. . . . .	4
*1.952	Ind. Hygiene . . . . .	2
*1.953	Env. Micro. . . . .	2
1.954	Stream Sanit. . . . .	2
1.996	Sem.-Env. Health . .	2

### WINTER QUARTER

1.904	Hydraulics . . . . .	4
*1.907	Water Resources III .	2
*1.951	Rad. Health . . . . .	2
1.956	Air Pollution Eng. . .	4
1.994	Sem.-Env. Eng. . . . .	2

## PART-TIME PROGRAMS

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their ability to combine their study load with their employment load.

### REQUIRED COURSES

Structural Engineering		Credits	Environmental Engineering		Credits
1.841	Struc. Analysis I . . .	2	1.910	Water & Waste Treat. I . . . . .	2
1.842	Struc. Analysis II . . .	2	1.911	Water & Waste Treat. II . . . . .	2
1.843	Struc. Analysis III . .	2	1.912	Water & Waste Treat. III . . . . .	2
10.8A3	Adv. Mathematics . .	2	1.920	Env. Chemistry I . . .	2
		8	1.921	Env. Chemistry II . . .	2
			1.922	Env. Analysis I . . . .	2
			1.930	Env. Analysis I . . . .	2
			1.931	Env. Analysis II . . . .	2
			1.993	Master's Report . . . .	4
			or		
			1.991	Thesis . . . . .	8
					20 or 24

\*Offered evening only.

\*\*Offered both day and evening.

## **Electives**

Students in the structural engineering option must elect 26 quarter hours from civil engineering courses within the structural engineering field. (Courses in the 800 series.) Students in the environmental engineering option must elect 14 quarter hours from civil engineering courses within the environmental engineering field. (Courses in the 900 series.)

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for both full- and part-time students in order that an approved program of electives may be arranged with the individual. For part-time students it is suggested that only required courses be taken in the first quarter. During that quarter an interview should be scheduled within the department for preliminary planning of the remainder of the individual program.

## **THE DOCTOR'S DEGREE**

### **Full-Time Program**

The following material outlines the procedures for admission to the doctoral program in environmental engineering and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Civil Engineering.

### **Admission**

Each student admitted to the program will initially have the status of doctoral student. In the usual case, he will have received a master's degree in an appropriate field of engineering or science prior to entry into the program. Applicants should apply to the Chairman of the Department of Civil Engineering for admission to the doctoral program, preferably by February 1st. The departmental graduate committee will interview the applicant, examine his record, and decide whether he should be admitted to the program. The chairman of the department will appoint a program adviser for each doctoral student, upon the recommendation of the departmental graduate committee.

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work after admission as a doctoral student. However, it is expected that at least two years of full-time graduate study will be required beyond the master's degree.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general graduate school regulations. At least one year of full-time study and successful completion of the qualifying examination are required for consideration as a doctoral degree candidate.

### **Qualifying Examination**

The qualifying examination will consist of a written and an oral section. The written part will cover: (1) environmental engineering and/or science and (2) selected areas depending upon the educational background and interest of the student. In certain cases the student may be exempted from the written part of the examination. The oral portion will measure general comprehension. If the oral examination is failed, it may be repeated with permission of the departmental graduate committee. The qualifying examination shall be completed no later than two years after admittance as a doctoral student.

### **Comprehensive Examination**

The comprehensive examination is given after the thesis has been completed. This examination is based upon the defense of the thesis.

### **Course Requirements**

Course requirements for each applicant will be determined by the departmental graduate committee. Formal course work will be selected to meet the individual student's objectives. Graduate level study up to 12 quarter hours of course work, completed under programs other than this full-time program may be accepted, but requires approval of the departmental graduate committee.

### **Thesis**

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

A thesis committee will be appointed by the chairman of the departmental graduate committee. The thesis committee, consisting ordinarily of five members, two of whom are from other departments, will be informed of the progress of the thesis and will be responsible for its approval.

### **Language Requirement**

A reading knowledge of one foreign language is required. The requirement shall be determined in a manner prescribed by the departmental graduate committee, and must be satisfied prior to taking the oral qualifying examination.

## DESCRIPTION OF COURSES

*All courses carry two quarter hours of credit unless otherwise noted. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.*

### 1.801 Transportation Analysis I

Principles of transportation systems analysis; probability, statistics, sampling theory, and linear regression techniques in traffic design; traffic flow forecasting. *Prep. Admission to Graduate School of Engineering.*

Offered 1971-72, fall quarter

### 1.802 Transportation Analysis II

Evaluation of alternate designs; economic, social, and public policy amplifications on transportation designs; model split and cost-benefit analysis. *Prep. 1.801, Transportation Analysis I.*

Offered 1971-72, winter quarter

### 1.803 Traffic Flow Theory I

Statistical methods in traffic flow theory; probability models, hypothesis testing and their uses; queuing theory and simulation techniques. *Prep. 1.802, Transportation Analysis II.*

Offered 1971-72, spring quarter

### 1.841 Structural Analysis I

Review of basic principles of structural analysis, determinacy, indeterminacy, stability. Introduction to energy methods and virtual work. Application of energy methods to equilibrium problems. *Prep. Differential and Integral Calculus plus Theory of Structures.*

Offered yearly, fall quarter

### 1.842 Structural Analysis II

A complete treatment of moment distribution including non-prismatic members, axial load, and shear distribution. Introduction to plastic analysis and approximate methods of analysis. *Prep. 1.841, Structural Analysis I.*

Offered yearly, winter quarter

### 1.843 Structural Analysis III

Introduction to matrix methods of structural analysis, including stiffness and flexibility methods. *Prep. 1.842, Structural Analysis II.*

Offered yearly, spring quarter

### 1.844 Structural Analysis IV

Introduction to advanced structural mechanics including plane stress, plane strain, torsion on non-circular sections, and development of finite element method of analysis. *Prep. 1.843, Structural Analysis III.*

Offered 1972-73, fall quarter

### 1.847 Structural Analysis (4 q.h. credits)

This course, offered to day students, embodies the material in 1.841 and 1.842 — Structural Analysis I and II. *Prep. Differential and Integral Calculus plus Theory of Structures.*

Offered yearly, fall quarter

**1.849 Model Analysis**

Development of the principles of similitude to establish the relationship between behavior in the model and the full-sized structure. Review of techniques to fabricate, to load, and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure. *Prep. Admission to program and approval of instructor.*

Offered 1972-73, spring quarter

**1.850 Structural Dynamics I**

Analysis by exact and approximate methods of structures subjected to dynamic loads. *Prep. 1.843, Structural Analysis III.*

Offered 1972-73, winter quarter

**1.851 Structural Dynamics II**

Continuation of 1.850 with application to the design of structures subjected to blast loads and seismic loadings. Other applications will include self-induced vibrations and moving loads on structures. *Prep. 1.850, Structural Dynamics I.*

Offered 1972-73, spring quarter

**1.853 Concrete Structures I**

Behavior of concrete under stress and strain. Analysis of modes of failures of concrete members in laboratory tests. A survey of failures of structures resulting from inadequate design and from major causes (earthquakes, accidents, fatigue). Lessons to be learned leading to the derivation for a "Force-Strain Theory" for the analysis of structural systems. Combining the basic analysis of all reinforced concrete, pre-stressed concrete (normal reinforced concrete with normal forces); two dimensional systems (plates, deep girders, walls); three dimensional structures (developable and non-developable surfaces) into a single "Force-Strain Theory" analysis. *Prep. Reinforced Concrete Design.*

Offered yearly, fall quarter

**1.854 Concrete Structures II**

Application of "Force-Strain Theory" to progressive design methods for continuous members (beams, girders, bridges), rigid frames (plant and utility structures, high rise office and apartment buildings, and bridges). Analysis of three dimensional rigid frames for single and multi-story structures. Corresponding construction details, practical aspects of field operations connected with a particular design, and evaluation of materials most suitable structurally and economically to be used (strength and type of concrete, type of steel — normal reinforcing or pre-stressing). *Prep. 1.853 Concrete Structures I.*

Offered yearly, winter quarter

**1.855 Concrete Structures III**

Design of two dimensional bearing surfaces (plates, deep girders, walls), three dimensional systems (folded plates, shells of developable and non-developable surfaces). Analysis and design of tension and compression systems and derivation of structural systems based on principles of above analysis (hanging roof, suspension bridges and structures, use of compression rings, etc.). Future trends in design and analysis of concrete structures. *Prep. 1.854, Concrete Structures II.*

Offered yearly, spring quarter



**1.856 Structural Analysis (4 q.h. credits)**

This course, offered to day students, embodies the course content offered in 1.843, Structural Analysis III and 1.844, Structural Analysis IV. *Prep. 1.847, Structural Analysis.* Offered yearly, spring quarter

**1.857 Structural Dynamics (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.850 and 1.851 — Structural Dynamics I and II. *Prep. 1.856, Structural Analysis.*

Offered yearly, winter quarter

**1.858 Concrete Structures (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.853 and 1.854 — Concrete Structures I and II. *Prep. Reinforced Concrete Design.*

Offered yearly, fall quarter

**1.859 Structural Stability**

Elastic and inelastic stability of structures including beams, columns, plates, and shells. *Prep. 1.843, Structural Analysis III.* Offered 1972–73, fall quarter

**1.861 Design of Structures I**

An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads are considered. *Prep. 1.842 Structural Analysis II.*

Offered yearly, fall quarter, evenings

Offered yearly, spring quarter, days

**1.862 Design of Structures II**

An analysis and design course in structural steel in which the emphasis is on plastic behavior. Design problems involving plastic hinge location in frames and the design of rigid frames using AISC Specs, Section 2, are among the topics considered. *Prep. 1.861, Design of Structures I.*

Offered yearly, winter quarter

**1.863 Design of Structures III**

Advanced problems in elastic and plastic design of structural steel. Use of high strength steels in building frames. A design project chosen by the student, with approval of the instructor, will be completed in this term. *Prep. 1.862, Design of Structures II.*

Offered yearly, spring quarter

**1.864 Design of Structures (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.862 and 1.863 — Design of Structures II and III. *Prep. 1.861, Design of Structures I.*

Offered yearly, winter quarter

**1.871 Engineering Properties of Soils I**

Review of phase relationships, soil consistency, etc.; permeability and capillarity; effective stress concept, analysis of seepage in porous media; stress distribution; introduction to settlement analysis. *Prep. Undergraduate course in basic soil mechanics.*

Offered yearly, fall quarter

**1.872 Engineering Properties of Soils II**

A continuation of course 1.871. The course covers consolidation theory and settlement analysis; shear strength properties of soils; stability analysis of



open and braced cuts; and earth pressure theory and analysis. *Prep. 1.871, Engineering Properties of Soils I.* Offered yearly, winter quarter

### **1.873 Soils Testing Laboratory**

Emphasis on the soil behavior aspects of consolidation theory, settlement analysis, and shear strength. Approximately one-half of the term is devoted to laboratory studies in soil compaction, consolidation, and shear strength. *Prep. 1.871, Engineering Properties of Soils I.* Offered yearly, spring quarter, evenings  
Offered yearly, winter quarter, days

### **1.874 Soil Mechanics and Foundation Engineering I**

Review of important characteristics of granular and cohesive soils with respect to relative density and strength. Bearing capacity of soils; design of isolated and combined footings, raft and mat foundations. Deep foundations — caissons and piles. Load tests of above foundations, and interpretation of results. Practical aspects of foundations work in view of field conditions and economy. *Prep. 1.872, Engineering Properties of Soils II.* Offered yearly, fall quarter

### **1.875 Soil Mechanics and Foundation Engineering II**

Stress and strain in soils. Principal stress relations in soil: pressure distribution theory, their limits and practical approach; Boussinesq's-Westergaard's-Froelich's-Newmark's methods. Settlement calculations based on laboratory test results and approximate methods. Time settlement relationship. Lateral earth pressure; design of retaining structures, such as crib walls, retaining walls, and bulkheads. Stability of slopes. *Prep. 1.874, Soil Mechanics and Foundation Engineering I.* Offered yearly, winter quarter

### **1.876 Soil Mechanics and Foundation Engineering III**

Special topics in foundation engineering. Marine structures — piers, wharves, dolphins, off-shore structures — cofferdams, vibroflotation, and stabilization of soils for foundations by use of chemicals and other means. *Prep. 1.875, Soil Mechanics and Foundation Engineering II.* Offered yearly, spring quarter

### **1.877 Engineering Properties of Soils (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.871 and 1.872 — Engineering Properties of Soils I and II. *Prep. Undergraduate course in basic soil mechanics.* Offered yearly, fall quarter

### **1.878 Foundation Engineering (4 q.h. credits)**

This course, offered to day students, embodies the course content offered in 1.874 and 1.875 — Soil Mechanics and Foundation Engineering I and II. *Prep. 1.877 Engineering Properties of Soils.* Offered yearly, spring quarter

### **1.882 Engineering Geology I**

Origin and occurrence of various rock types; geological structures; faulting, joint systems, weathering of rock, grouting. Field trip. *Prep. Admission to Graduate School of Engineering.* Offered 1971-72, fall quarter

### **1.884 Rock Mechanics I**

Interrelationship with other disciplines; index properties; classification systems; laboratory tests; state of stress and stress distribution. *Prep. 1.882, Engineering Geology I.* Offered 1971-72, winter quarter

**1.885 Rock Mechanics II**

Behavior of rock under combined stresses; pore pressure effects; failure theories; in-site deformation modulus and shear strength characteristics; field testing. *Prep. 1.884, Rock Mechanics I.* Offered 1971-72, spring quarter

**1.892 Numerical Methods in Structural Mechanics I**

Formulation and numerical solution of civil engineering problems in structural mechanics. Emphasis will be on lumped parameter systems. Equilibrium, eigenvalue, and propagation type problems will be covered. *Prep. 1.843, Structural Analysis III.* Offered 1972-73, winter quarter

**1.893 Numerical Methods in Structural Mechanics II**

Continuation of 1.892. *Prep. 1.892, Numerical Methods in Structural Mechanics I.* Offered 1972-73, spring quarter

**1.894 Numerical Methods in Structural Mechanics (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.892 and 1.893 — Numerical Methods in Structural Mechanics I and II.

Offered yearly, spring quarter

**1.897 Master's Report (Structural) (4 q.h. credits)**

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of structural engineering selected by student and advisor resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

**1.898 Special Topics in Structural Engineering (2 q.h. credits)**

An individual effort in an area selected by student and adviser resulting in a definitive report. Open to day students only. *Prep. Admission to Graduate School of Engineering.* Offered yearly, all quarters

**1.899 Thesis (Master's Degree) (8 q.h. credits)**

Analytical and/or experimental work conducted by arrangement with and under supervision of the department. *Prep. Permission of the department.*

Offered yearly, all quarters

**1.901 Hydraulics I**

Mechanical properties of fluids — fluid statics, continuity, energy relationships (Bernoulli and Euler equations), momentum, dimensional analysis, steady flow in conduits under pressure, pipe systems. *Prep. Undergraduate course in hydraulics.* Offered yearly, fall quarter

**1.902 Hydraulics II**

Open channel flow — energy relationships, critical flow, controls, momentum principles, flow resistance, uniform flow, gradually varied flow, local phenomena. *Prep. 1.901, Hydraulics I.* Offered yearly, winter quarter

**1.903 Hydraulics III**

Open channel flow — channel transitions; unsteady flow; potential flow — velocity potential function and stream function; selected topics in hydraulics and fluid mechanics. *Prep. 1.902, Hydraulics II.* Offered yearly, spring quarter

**1.904 Hydraulics (4 q.h. credits)**

This course, offered to day students, embodies substantially the material in 1.902 and 1.903 — Hydraulics II and III. *Prep. Undergraduate course in hydraulics.* Offered yearly, winter quarter

**1.905 Water Resources Planning I**

Hydrologic cycle; precipitation studies including data adjustment; areal variability; intensity — duration — frequency relationships; runoff studies including data adjustment; peak flows; drainage design; unit hydrographs; infiltration and evapotranspiration; groundwater; flow nets; well hydraulics; steamflow; floods; stream routing; collection and storage of runoff; reservoir routing. *Prep. Admission to Graduate School of Engineering.* Offered yearly, fall quarter

**1.906 Water Resources Planning II**

River and drainage basin morphology; hydrogeology; erosion and sediment transport process; sedimentation in reservoirs and channels; reservoir studies including system operation; regulation; flood-control; low-flow augmentation; hydrology of urban areas; water resources planning including economic analysis and alternative uses of water resources; water law, policy, and management. *Prep. 1.905, Water Resources Planning I.* Offered yearly, winter quarter

**1.907 Water Resources Planning III**

Statistical studies applied to hydrologic data, including basic statistics; frequency and probability distributions; methods of frequency analysis; multiple linear regression and correlation analysis; introduction to mathematical modeling of hydrologic processes including discussion of deterministic, probabilistic, and stochastic processes; techniques of linear and dynamic programming; time series analysis, queuing theory, Markov chains; system design by optimization and simulation. *Prep. 1.906, Water Resources Planning II.*

Offered yearly, spring quarter

**1.910 Water and Waste Treatment I**

Water usage, water quality, the theory and practice of water treatment, and the basic design of water supply and treatment works including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection, and fluoridation. *Prep. Admission to Graduate School of Engineering.* Offered yearly, fall quarter

**1.911 Water and Waste Treatment II**

The theory and practice of sewage treatment and disposal; basic design of primary and secondary treatment works including screening, grit removal, sedimentation, biological stabilization processes, sludge digestion, waste stabilization ponds, and disinfection. *Prep. 1.910, Water and Waste Treatment I.*

Offered yearly, winter quarter

**1.912 Water and Waste Treatment III**

Advanced waste treatment and special applications in water and waste treatment including corrosion control, disinfection, pumping and storage facilities, application of chemicals, and salt water conversion. Emergency installations for both water supply and waste disposal. Instrumentation and automatic controls. *Prep. 1.911, Water and Waste Treatment II.* Offered yearly, spring quarter

**1.913 Industrial Waste Disposal**

Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their waste water problems; industrial waste survey techniques; characteristics and effects of industrial wastes; waste reduction methods; adaptation of physical, chemical, biological, and advanced treatment methods; and joint treatment of industrial wastes with municipal sewage. *Prep. 1.921, Environmental Chemistry II.*

Offered yearly, fall quarter, evenings

Offered yearly, spring quarter, days

**1.914 Water and Waste Treatment (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.910 and 1.911 — Water and Waste Treatment I and II. *Prep. Two undergraduate semesters of Hydraulics.*

Offered yearly, fall quarter

**1.920 Environmental Chemistry I**

Analytical chemistry principles are studied with reference to environmental engineering applications. The chemistry of processes such as coagulation, iron and manganese removal, ion exchange, softening, and disinfection are included. The principles of spectroscopy and polarography are also discussed. *Prep. Two semesters of general chemistry.*

Offered yearly, fall quarter

**1.921 Environmental Chemistry II**

A continuation of 1.920 including gas transfer, oxidation and reduction, and radiation chemistry. Reaction rates with reference to environmental engineering applications such as BOD are discussed. Topics in organic chemistry and instrumental analysis are included. *Prep. 1.920, Environmental Chemistry I.*

Offered yearly, winter quarter

**1.922 Environmental Bacteriology**

A study of bacteriology with emphasis on environmental engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction, and metabolism of bacteria. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. Methods of quantitative bacteriology are also covered. *Prep. 1.921, Environmental Chemistry II.*

Offered yearly, spring quarter

**1.923 Environmental Chemistry (4 .q.h. credits)**

This course, offered to day students, embodies the material in 1.920 and 1.921 — Environmental Chemistry I and II. *Prep. Two semesters of General Chemistry.*

Offered yearly, fall quarter

**1.930 Environmental Analysis I**

A laboratory course emphasizing accepted analytical procedures for the characterization of water and wastewater. Analyses are performed in conjunction with various water and wastewater treatment processes such as coagulation, iron and manganese removal, and water softening; analytical procedures of standard methods of the American Public Health Association and pertinent advances in analytical techniques reported in the literature are employed; interpretation of results in environmental reports. *Prep. 1.921, Environmental Chemistry II.*

Offered yearly, winter quarter

NOTE: It is strongly recommended that this course and 1.931 be taken simultaneously with 1.921 and 1.922.

**1.931 Environmental Analysis II**

The laboratory analyses of water and wastewater are continued with emphasis on the chemical and biological analyses associated with water and waste treatment methods; microbiological techniques utilizing microscopy and membrane filter preparation; emphasis on environmental reports. *Prep. 1.930, Environmental Analysis I.* Offered yearly, spring quarter

**1.933 Environmental Analysis (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.930 and 1.931 — Environmental Analysis I and II. *Prep. 1.923, Environmental Chemistry taken simultaneously.* Offered yearly, fall quarter

**1.935 Environmental Laboratory — Unit Operations I**

Laboratory scale unit operations and processes in water and waste treatment to obtain criteria for system design; corrosion control, chromium waste treatment, sedimentation, pressure flotation, vacuum filtration, ion exchange, and adsorption. Reports are required which develop design criteria and select treatment processes. *Prep. 1.931, Environmental Analysis II.*

Offered 1971–72, winter quarter

**1.936 Environmental Laboratory — Unit Operations II**

Laboratory scale pilot plant operations; biological treatment processes such as activated sludge, stabilization ponds, aerated lagoons, and anaerobic digestion; reports developing treatment process selection. *Prep. 1.935, Environmental Laboratory — Unit Operations I.* Offered 1971–72, spring quarter

**1.938 Environmental Analysis (4 q.h. credits)**

This course, offered to day students, embodies the material in 1.935 and 1.936 — Environmental Laboratory. *Prep. 1.933, Environmental Analysis and 1.913, Industrial Waste Disposal.* Offered yearly, spring quarter

**1.940 Public Health Engineering Survey**

An historical survey of public health conditions to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, fall quarter

**1.945 Solid Waste Management**

Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. *Prep. Admission to Graduate School of Engineering.* Offered 1971–72, fall quarter

**1.946 Waste Reclamation**

Review and analyses of various unit operations useful or potentially useful in the separation and processing of salvageable materials from municipal refuse and incinerator residue; economics, management and regulatory practices affecting recovery and recycle possibilities. *Prep. 1.945, Solid Waste Management.* Offered 1971–72, winter quarter

**1.947 Incineration**

Incinerator design and operation examining the combustion process, design problems and solutions, special incinerators for salvage and industrial operations, performance testing, and pollution control requirements. *Prep. 1.946, Waste Reclamation.* Offered 1971-72, spring quarter

**1.948 Solid Waste Laboratory**

A laboratory and design course, offered to day students, covering practices related to the physical, chemical, and biological analysis of refuse, residue, quench waters, and leachate. Field studies involving current local problems. Students will design systems to solve the problems. *Prep. 1.945, Solid Waste Management.* Offered yearly, winter quarter

**1.950 Air Pollution**

Theory and practice related to engineering management of air resources; microclimate and dispersion of pollutants; atmospheric chemistry; air pollution instrumentation; control of gaseous and particulate emissions; and design of air pollution control systems. (Open to engineering majors only.) *Prep. Admission to Graduate School of Engineering* Offered 1971-72, fall quarter

**1.951 Radiological Health Engineering**

Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid, and gaseous radioactive wastes. Regulatory agency requirements. *Prep. Admission to Graduate School of Engineering.* Offered yearly, winter quarter

**1.952 Industrial Hygiene**

Factors in the industrial environment that adversely affect the health, comfort, and efficiency of the worker. Industrial surveys and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature, and humidity. *Prep. Admission to Graduate School of Engineering.* Offered yearly, spring quarter

**1.953 Environmental Microbiology**

An advanced course in microbiology studying microorganisms found in water, soil, milk, and food—including fresh water algae. Applied microbiology is discussed concerning taste and odor organisms, trickling filters, activated sludge, digesters, lagoons, and composting. *Prep. 1.922, Environmental Bacteriology.* Offered yearly, spring quarter

**1.954 Stream Sanitation**

The basic principles of stream sanitation and corrective control methods. Topics include: aerobic and anaerobic decomposition, oxygen balance, eutrophication, mixing and dispersion, estuarine pollution and pesticide effects, bacterial pollution, industrial pollution, water supply, shellfish, fish life, riparian rights, recreation, and general stream sanitation. *Prep. 1.920, Environmental Chemistry I.* Offered yearly, spring quarter

**1.955 Air Sampling and Analysis**

A laboratory course on air pollution measurements utilizing physical, chemical, and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitative measurements



of pollutants are performed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. *Prep. 1.950, Air Pollution.*

Offered yearly, winter quarter

#### **1.956 Air Pollution Engineering (4 q.h. credits)**

This course offered to day students embodies the material of 1.950, Air Pollution and 1.955, Air Sampling and Analysis. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, winter quarter

#### **1.957 Air Pollution Science**

Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. (Open to non-engineering majors only.) *Prep. Consent of the department and instructor.*

Offered yearly, fall quarter, days

#### **1.960 Hydraulic Structures I**

Dams and associated structures. Design criteria and preliminary analyses for gravity, arch, buttress, rock-fill and earth-fill dams. Foundation treatment and scour protection. Spillway structures. Gates. Navigation requirements of large rivers. Fishways. *Prep. Undergraduate course in hydraulics.*

Offered 1972-73, fall quarter

#### **1.961 Hydraulic Structures II**

Intake structures in reservoirs and on rivers. Tunnels and pipe lines: design criteria and structural analyses; economic studies for diameter selection. Penstocks and anchor blocks. Canals — seepage and erosion, linings, canal structures. *Prep. Undergraduate course in hydraulics.*

Offered 1972-73, winter quarter

#### **1.962 Hydraulic Structures III**

Surge tanks: selection of type. River regulation: design principles, flood protection and navigation requirements, bank revetments, groins, dikes, and levees. Cofferdams. Operation and maintenance of hydraulic structures. *Prep. Undergraduate course in hydraulics.*

Offered 1972-73, spring quarter

#### **1.991 Thesis (Master's Degree) (8 q.h. credits)**

Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.*

Offered yearly, all quarters

#### **1.992 Special Topics in Environmental Engineering (2 q.h. credits)**

An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, all quarters

#### **1.993 Master's Report Environmental Engineering (4 q.h. credits)**

An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of environmental engineering selected by student and advisor resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*

Offered yearly, all quarters

**1.994 Seminar — Environmental Engineering**

Discussions by professional engineers and scientists, faculty, and graduate students on subjects within the area of environmental engineering. Open to day students only. *Prep. Consent of the instructor.*

Offered yearly, winter quarter

**1.996 Seminar — Environmental Health**

Discussion by professional people in the public health field, faculty, and graduate students on subjects within the area of environmental health. Open to day students only. *Prep. Admission to Graduate School of Engineering.*

Offered yearly, spring quarter



# electrical engineering

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in electrical engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification. In some cases, students whose Bachelor of Science degree is in some other engineering or related science field may qualify for the degree of Master of Science in Electrical Engineering. This requires special approval of the Department of Electrical Engineering.

## THE MASTER'S DEGREE

### Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan one group of students takes academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. Another group may take the academic work in the Winter Quarter of the first year and in the Fall and Spring Quarters of the second year. In either case, the other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
3.827 Linear Systems		3.832 Network Synthesis I	4
Analysis .....	4	3.990 Seminar I .....	2
3.842 Linear Active Circuits	4	10.8G1 Probability .....	2
3.823 Mathematical		Electives .....	4 or 6
Methods in Electrical			12 or 14
Eng. ....	4		
Electives .....	2 or 4		
	14 or 16		

Third Academic Quarter	Credits
3.877 Electromagnetic Theory .....	4
3.991 Seminar II .....	2
Electives .....	8 or 10
	<hr/> 14 or 16

A limited amount of work may be elected from the part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available in the Graduate School Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic adviser.

### Electives

The electives will normally be available according to the following schedule:

#### Fall Quarter

- 3.902 Communication Theory — Introduction
- 3.959 Control Theory I — Analysis and Synthesis
- 3.979 Electronic Digital Computers

#### Winter Quarter

- 3.803 Plasma and Gas Discharge
- 3.838 Nonlinear Circuit Analysis I
- 3.902 Communication Theory — Introduction
- 3.909 Communication Theory — Detection
- 3.962 Control Theory II — Nonlinear and Sampled-Data Systems
- 3.979 Electronic Digital Computers

#### Spring Quarter

- 3.839 Nonlinear Circuit Analysis II
- 3.883 Advanced Electromagnetic Theory
- 3.902 Communication Theory — Introduction
- 3.905 Communication Theory — Information Theory and Coding
- 3.965 Control Theory III — Optimal Control and Stochastic Systems

(Additional electives will be available from the late afternoon portion of the part-time program in all quarters.)

### Full-Time Program

For those students whose programs would be better served by full-time study the prescribed courses may be taken in one academic year. The sequence of the required courses will be different from the full-time program on the Cooperative Plan.

## Power Systems Option

### Full-Time Program on the Cooperative Plan

The integrated six-year program for students enrolled in the power systems engineering curriculum culminates in a graduate year on the Cooperative Plan. Under this arrangement all students are combined into one division and take academic work during the Fall and Spring Quarters while engaged in cooperative work during the Summer and Winter Quarters.

Forty quarter hours of academic work are required. Those students who have completed five years of the integrated undergraduate program have earned six quarter hour credits of graduate work prior to their graduate year and hence complete only 34 additional quarter hours of credit.

The power option is also available to students electing a normal two-year cooperative plan or a one-year full-time, non-cooperative plan.

Courses taken by students in the six-year integrated program are:

Fall Academic Quarter	Credits	Spring Academic Quarter	Credits
3.827 Linear Systems		3.931 Power Systems	
Analysis .....	4	Planning .....	4
3.928 Analysis of		3.944 Special Topics in	
Power Circuits .....	4	Power .....	2
3.990 Seminar I .....	2	3.991 Seminar II .....	2
Electives .....	6	Electives .....	10
	16		18
*3.823 Mathematical		*10.8G1 Probability .....	2
Methods in Electrical			20
Eng. ....	4		
	20		

### Electives

In addition to the electives listed for the Electrical Engineering Day-Graduate Cooperative Program, the following courses are suggested for consideration by the power option students:

#### Fall Quarter

- 3.932 Power System Protection
- 3.935 Computers in Power Systems I
- 3.940 Electric Machinery Theory I
- 3.943 Advanced Power Laboratory (By special arrangement)
- 3.944 Special Topics in Power
- 3.959 Control Theory I — Analysis and Synthesis
- 5.801 Analysis of the Industrial Enterprise I
- 2.920 Direct Energy Conversion

\*Taken by six-year students during undergraduate quarters 9 and 10.

**Winter Quarter**

- 3.933 Power Systems Transients
- 3.936 Computers in Power Systems II
- 3.941 Electric Machinery Theory II
- 3.943 Advanced Power Laboratory (By special arrangement)
- 3.944 Special Topics in Power
- 3.962 Control Theory II — Nonlinear and Sampled-Data Systems
- 5.802 Analysis of the Industrial Enterprise II
- 5.812 Management of Technical Innovation
- 2.921 Direct Energy Conversion

**Spring Quarter**

- 3.934 Power System Stability
- 3.937 Computers in Power Systems III
- 3.942 Electric Machinery Theory III
- 3.943 Advanced Power Laboratory (By special arrangement)
- 3.965 Control Theory III — Optimal Control and Stochastic Systems
- 3.998 Special Problems in Electrical Engineering
- 5.818 Management Information Systems
- 5.820 Personnel Administration for Engineers
- 5.950 Engineering Statistics I
- 2.923 Special Topics in Direct Energy Conversion

### **Part-Time Program**

#### **Electrical Engineering**

**Admission**

The admission requirements for the part-time program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

	<b>Credits</b>
3.975    Precs of Modern Electrical Engineering I .....	2
3.976    Precs of Modern Electrical Engineering II .....	2
3.977    Precs of Modern Electrical Engineering III .....	2
3.978    Precs of Modern Electrical Engineering IV .....	2
10.8A1    Advanced Mathematics .....	2
10.8A2    Advanced Mathematics .....	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

## Program

To a substantial extent, the program of study is an elective one. The student is expected to select a well-balanced group of courses emphasizing one or two aspects of electrical engineering. Forty quarter hours of academic work are required for the master's degree of which eight quarter hours of credit are specified as follows:

	Required Courses	Credits
3.825	Linear Systems Analysis II .....	2
3.826	Linear Systems Analysis III .....	2
10.8A3	Advanced Mathematics .....	2
	or	
3.820	Mathematical Methods in Electrical Eng. I .....	2
10.8A4	Advanced Mathematics .....	2
	or	
3.821	Mathematical Methods in Electrical Eng. II .....	2
		<hr/> 8

## Electives

Thirty-two quarter hours of credit are elective. Twenty quarter hours of elective credit must be chosen from the Electrical Engineering Department.

A maximum of 12 quarter hours of credit may be selected from graduate courses in sciences or other engineering departments for which the student has the necessary preparation. However, any such course should be taken in the major department concerned with the subject matter. For example, a course largely involving mathematical techniques should be taken in the Mathematics Department.

## Quarter-Sequence Courses

Certain courses have an A or B after the course title. In these cases, credit will be given toward the degree only if both the A and B courses are successfully completed.

## Electro-Optics (Modern Optics) Program

The Electro-Optics Program is structured to provide the engineer or scientist with a strong background in modern optical techniques. Emphasis is placed on the application of these techniques to current industrial and research problems.

## Admission

To be enrolled for this degree program, applicants must have a Bachelor of Science degree in electrical engineering or physics, with an acceptable quality of undergraduate work from a recognized institution. Admission requirements are those of the regular program in electrical engineering.

## Program

Forty quarter hours of academic work are required, of which 32 are specified. At least four additional hours of electives in optics are to be chosen from the optics elective sequences listed below. The remaining four hours may be selected from optics electives in other sequences or from suitable courses in science or engineering.

The specified courses are listed below. The suggested sequence in which these courses should be taken is indicated.

First Year	Courses	Credits
10.8A3	Advanced Mathematics .....	2
	or	
3.820	Mathematical Methods in Electrical Eng. I .....	2
10.8A4	Advanced Mathematics .....	2
	or	
3.821	Mathematical Methods in Electrical Eng. II ....	2
*11.801	Introductory Modern Physics .....	2
3.900	Communication Theory — Introduction A .....	2
3.901	Communication Theory — Introduction B .....	2
3.914	Geometric Optics I .....	2
<b>Second Year</b>		
3.915	Geometric Optics II .....	2
3.916	Physical Optics I .....	2
3.917	Physical Optics II .....	2
3.918	Experimental Optics and Image Evaluation I ...	2
3.919	Experimental Optics and Image Evaluation II ..	2
3.920	Experimental Optics and Image Evaluation III ..	2
<b>Third Year</b>		
3.921	Optical Properties of Matter I .....	2
3.980	Optical Instrumentation Design Concepts ....	2
3.981	Radiometry and Photometry .....	2
3.982	Infra Red and Detector Theory .....	2
<b>Optics Elective Sequences</b>		
<b>Sequence I</b>		
3.922	Optical Properties of Matter II .....	2
3.923	Optical Properties of Matter III .....	2
<b>Sequence II</b>		
3.806	Lasers I .....	2
3.807	Lasers II .....	2
<b>Sequence III</b>		
3.983	Physical Optics III .....	2
3.984	Analytical and Control Instrumentation .....	2
<b>Optics Elective</b>		
3.808	Laser Applications .....	2

\*Students with a degree in physics may substitute 3.975, Precip of Modern Electrical Engineering I.

### Course Prerequisites

Prerequisites for each course are given so that the student will receive full benefit from the course. In case of doubt, the student should consult the Director of the Electro-Optics Program or the course instructor.

### Comprehensive Examination

Candidates for the master's degree in the electro-optics option are expected to demonstrate competence in several areas including geometric and physical optics. This will be done through a written examination which may be taken after the successful completion of specified courses. Arrangements should be made with the Director of the Electro-Optics Program by the beginning of the second quarter of the year in which the candidate expects to take the examination. By special arrangement with the faculty, a student may substitute 3.924, Advanced Optics Laboratory and Current Developments, for the examination requirement.

### Computer Science Option

The Computer Science Program is structured to provide a curriculum of study in computer science and engineering leading to the degree of Master of Science in Electrical Engineering, or Master of Science, with an option in computer science.

### Admission

To be enrolled for this degree program, applicants must have obtained a Bachelor of Science degree in engineering, mathematics, or the physical sciences from a recognized college or university and must present satisfactory evidence of ability to pursue graduate study.

### Program

Forty quarter hours of academic work are required, of which 12 are specified and 28 are elective.

Specified Courses	Credits
3.893 Digital Computer Programming I .....	2
3.894 Digital Computer Programming II .....	2
3.972 Electronic Digital Computers I .....	2
3.973 Electronic Digital Computers II .....	2
3.896 Numerical Methods and Computer Applications I .....	2
3.897 Numerical Methods and Computer Applications II .....	2
*3.990 Seminar .....	2

\*Seminar may be required of all full-time students.

## Electives

Sixteen quarter hours of credit must be chosen from the following list of courses:

- 3.860 Pulse Processing I
- 3.861 Pulse Processing II
- 3.895 Digital Computer Programming III
- 3.898 Combinatorial & Optimization Techniques I
- 3.899 Combinatorial & Optimization Techniques II
- 3.960 Control Theory II-A
- 3.961 Control Theory II-B
- 3.967 Switching Circuits I
- 3.968 Switching Circuits II
- 3.974 Electronic Digital Computers III
- 3.985 Fundamentals of Automatic Digital Machines I
- 3.986 Fundamentals of Automatic Digital Machines II
- 3.987 Fundamentals of Automatic Digital Machines III
- 3.988 Special Topics in Computer Science
- 3.989 Computer Peripherals
- 3.995 Thesis
- 3.998 Special Problems in Electrical Engineering
- 5.911 Linear Programming
- 5.916 Engineering Analysis Utilizing Data Processing
- 5.917 Information Retrieval Techniques
- 5.920 Computer Utility Systems

A maximum of ten quarter hours of credit may be selected from graduate courses in mathematics, physical sciences or other engineering departments with the approval of the student's academic adviser.

## Thesis

A thesis carrying six credits may be elected with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second half of the program.

## THE DOCTOR'S DEGREE

### Full-Time Program

The following material outlines the procedures for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Secretary, Department of Electrical Engineering.

### Admission

Students who have completed 40 quarter hours of graduate work with a satisfactory record and who are interested in pursuing a doctor's program, should contact the Electrical Engineering Department to request an application. The Ph.D. qualifying examinations are usually offered annually in the spring. Completed applications, together with



transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Department, 411 Dana Hall, no later than 1 December of the preceding year. Following evaluation of this material, the applicant will be informed whether or not he will be permitted to undertake the qualifying examinations. A personal interview is not required, but a student may arrange with the Secretary of the Electrical Engineering Graduate Committee, Professor Robert N. Martin (617-437-3041), for an appointment for further program details if desired. A student who has received approval to take the qualifying examinations is considered a pre-doctoral student until such time as he passes the examinations. Upon successful completion of the qualifying examinations he becomes a Ph.D. candidate.

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's adviser in order to give evidence that at least half of the time is being devoted to the requirements of the graduate school program.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general regulations of the graduate school.

### **Qualifying Examination**

The qualifying examination, offered annually, is composed of a written and an oral part. These examinations are normally taken after successful completion of 40 quarter hours of graduate work beyond the Bachelor of Science degree. The examinations are based on a knowledge of core material for an electrical engineer. Candidates may also pursue a Ph.D. with an option in modern optics or computer science. For students electing the optics option, a modified version of the qualifying examination is given to include material from the optics field. For those who elect the computer science option, a modified version of the qualifying examination is given to include material from the computer field. If the qualifying examination is failed, it may be repeated upon application to and with the permission of the department. For further information write to: Secretary, Electrical Engineering Graduate Committee, 411 Dana Hall, Northeastern University.

### **Comprehensive Examination**

During the time in which a student is a candidate for a doctoral degree he will be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

### **Course Requirements**

Successful completion of a doctoral program normally requires 70 quarter hours of satisfactory graduate level work exclusive of thesis research and doctoral reading courses.

Doctoral Seminar, 3.993 and 3.994 are the only required courses.

### **Thesis**

In some cases, arrangements for a thesis adviser may have been established before the completion of the qualifying examinations. In any case, such arrangements must be made as soon as possible after degree candidacy has been established. Depending upon the nature of a project, a thesis committee may be appointed by the chairman of the department. This committee will be kept informed of the progress of the thesis and will approve the thesis in its final form.

### **Language Requirement**

The language requirement may be satisfied in French, German, or Russian. The Princeton Educational Testing Service Language Examination is used for this purpose. The examination is administered by Northeastern University annually. If necessary, it may be taken at another institution.

### **Final Oral Examination**

This examination will be held in accordance with the general graduate school regulations.

## **THE ELECTRICAL ENGINEER DEGREE**

The Department of Electrical Engineering offers the graduate professional degree usually known as the Engineer Degree. This degree, offered at a number of institutions, usually requires about one year of full-time graduate study beyond the master's degree. The official title of the degree is "Electrical Engineer".

The following material outlines the procedures for admission to the Electrical Engineer degree program and the steps necessary to qualify for the degree. For further information applicants should write to Professor Robert A. Gonsalves, Department of Electrical Engineering, Room 329, Dana Hall, Northeastern University.

### **Admission**

Students who are interested in pursuing the Electrical Engineer degree should make application for admission to the program prior to April 1. A master's degree in electrical engineering or its equivalent and the approval of the departmental graduate committee is required for admission. In some cases, where the master's degree is not in elec-

trical engineering, a student may be admitted to the program with the stipulation that certain deficiencies be made up without credit toward the degree.

### **Classification and Degree Candidacy**

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

### **Residence Requirement**

The residence requirement is satisfied by two academic quarters of full-time graduate work during the same academic year or four academic quarters of half-time graduate work during a period of two consecutive academic years. In the latter case, the student's plan for satisfying residence requirements must be approved by his adviser.

### **Qualification and Examinations**

A student must maintain a B average in order to qualify for the degree. In some instances, a student may be required to take special examinations. Such examinations will be determined in each case by the departmental graduate committee.

### **Course Requirements**

The minimum course requirements will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40 allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in electrical engineering. The student's course program must be approved by his adviser.

### **Dissertation**

Each engineer degree student must complete a dissertation which demonstrates a high level of competence in research, development, or design in the field of electrical engineering. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate work.

### **Language Requirement**

No foreign language is required for the Electrical Engineer degree.

### **Final Oral Examination**

A final oral examination consisting of a defense of the dissertation may be required if the student's adviser and the departmental graduate committee so decide.

### **Transfer of Credits**

Approval for transfer of credit may be given by the departmental graduate committee upon request from the student.

## Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental graduate committee.

## Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.

## DESCRIPTION OF COURSES

*All courses carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses except where noted. Course descriptions are applicable to both day and evening courses. Quarters indicated following course descriptions refer primarily to the part-time program. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.*

### 3.800 Plasma and Gas Discharge I

Behavior, diagnostics, and generation of plasma and gas discharges; emphasis on the engineering and experimental point of view rather than on a rigorous theoretical treatment. First quarter optics include: non-relativistic dynamics of charged particles in static electric and magnetic fields, electromagnetic wave-plasma interactions (infinite media), elastic and inelastic collisions. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precs of Modern Electrical Engineering III.*

Fall quarter

### 3.801 Plasma and Gas Discharge II

Ionization, diffusion, sheaths, glow and arc discharges, magnetic field effects, and plasma oscillations. *Prep. 3.800, Plasma and Gas Discharge I.*

Winter quarter

### 3.802 Plasma and Gas Discharge III

Topics include, but are not restricted to, wave-plasma interactions in finite geometric and plasma diagnostic techniques. *Prep. 3.801, Plasma and Gas Discharge II.*

Spring quarter

### 3.803 Plasma and Gas Discharge (4 q.h. credits)

Open only to day students. Includes the material given in 3.800 and 3.801 — Plasma and Gas Discharge I and II. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precs of Modern Electrical Engineering III.*

Winter quarter

**3.806 Lasers I**

Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

**3.807 Lasers II**

Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems. *Prep. 3.806, Lasers I.* Winter quarter

**3.808 Laser Applications**

Applications of lasers and laser systems for a variety of engineering and basic science disciplines; specific laser optoelectronic devices. *Prep. 3.807, Lasers II or equivalent.* Spring quarter

**3.810 Plasma Dynamics I**

Electrodynamics of homogenous and stationary plasmas; definition of and relations among the linear plasma response functions and their role in power absorption; Hilbert transforms and sum rules; statistical mechanical aspects: von-Neumann-Liouville equation, linear response theory and the fluctuation-dissipation and compliance theorems; statistical basis for Omsager symmetry relations and sum rules. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory or equivalent.* Fall quarter

**3.811 Plasma Dynamics II**

Applications of the fluctuation-dissipation theorems to: equation of state for classical plasmas, interactions of relativistic test particles with relativistic plasmas, power loss calculations and derivations of the relativistic Fokker-Planck coefficients; the Vlasov equation for relativistic plasmas in external magnetic fields. *Prep. 3.810, Plasma Dynamics I.* Winter quarter

**3.812 Plasma Dynamics III**

Continuation of the Vlasov equation; Landau damping and beam-plasma instabilities; quasi-linear theory; theory of shock waves in plasma: Rankine-Hugoniot relations, structure, and stability; MHD instabilities: Rayleigh-Taylor and flute instabilities, etc. *Prep. 3.811, Plasma Dynamics II.* Spring quarter

**3.817 Physical Acoustics**

Radiation, transmission, and absorption phenomena of plane and spherical waves. Distributed-system analogies, simple sources, dipole sources, radiation impedance, and radiation patterns. Diffraction theory, and ray acoustics, Finite amplitude waves, and shock waves. The effects of inhomogeneities and of dissipation processes on sound transmission. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

**3.818 Speech Communications**

Theory of acoustic transducers, such as microphones, loudspeakers, and horns. Mechanism of speech production and the acoustic properties of the vocal system. Hearing and psychoacoustics, Analog synthesizers of speech. Speech coding and transmission systems. *Prep. 3.817 Physical Acoustics.* Winter quarter

**3.819 Underwater Sound**

Fundamentals of sonar and acoustic signal processing. Echo ranging and direct listening. Model of the underwater acoustic channel. Matched filters and correlation detection. *Prep. 3818 Speech Communications.* Spring quarter

**3.820 Mathematical Methods in Electrical Engineering I**

Definition and representation of a complex variable and functions of a complex variable. Laurent series, residues, contour integration, and saddle point method of integration. Multivalued functions, Riemann surfaces and conformal mapping. Electrical engineering applications to Fourier theory, Hilbert transforms, stability of linear systems and electrostatics. (Not open to Northeastern graduates who have completed 3.292). *Prep. Bachelor of Science degree in Engineering or Physical Science.* Fall quarter

**3.821 Mathematical Methods in Electrical Engineering II**

Linear algebra and matrix analysis applied to systems theory; linear equations, determinants, invariance, quadratic forms, eigenvalues and the simultaneous diagonalization of two matrices. Compound matrices and the Binet-Cauchy Theorem. Illustrative applications to electrical engineering problems drawn from circuit theory, topology, probability theory, and engineering physics. (Not open to Northeastern graduates who have completed 3.293). *Prep. Bachelor of Science degree in Engineering or Science.* Winter quarter

**3.822 Mathematical Methods in Electrical Engineering III**

Special applications of mathematics to scalar and vector field problems. The partial differential equations of applied physics with emphasis on electromagnetic fields. Green's function techniques. Multidimensional transform theory and its application to analysis of the electromagnetic field. *Prep. 3.820 and 3.821 or equivalent and Electromagnetic Field Theory.* Spring quarter

**3.823 Mathematical Methods in Electrical Engineering (4 q.h. credits)**

This course, offered to day students, embodies the material in 3.820 and 3.821, Mathematical Methods in Electrical Engineering I and II. (Not open to Northeastern graduates who have completed 3.293). *Prep. Bachelor of Science degree in Engineering.* Fall and winter quarters

**3.824 Linear Systems Analysis I (Fundamental Precepts)**

A study of the basic concepts of time and frequency domain analysis including differential equations and systems of simultaneous first order equations, integral solutions including superposition and convolution integrals and Green's function solutions; the application of complex variable theory to the study of Laplace and z-transforms; the application of matrix theory to systems analysis. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precip of Modern Electrical Engineering I. Recommended are courses 3.820 and 3.821 or their equivalent.* Fall, winter, and spring quarters

**3.825 Linear Systems Analysis II (State Variable Representation of Systems)**

A continuation of program begun with 3.824. Introduction to state variable analysis of continuous and discrete systems. Standard canonical representations.

Computer simulation of systems behavior. Solution of state equations for linear time invariant systems. Analysis of transient response. *Prep. 3.824, Linear Systems Analysis I or equivalent.* Fall, winter, and spring quarters

### **3.826 Linear Systems Analysis III (Applications of State Variable and Transform Techniques)**

A continuation of 3.825. Extensions of techniques to time varying systems. Stability and related matters. Introduction to optimization and optimal systems. Observability and controllability. Further applications to discrete as well as continuous systems. The application of digital computers to systems analysis. *Prep. 3.825, Linear Systems Analysis II.* Winter and spring quarters

### **3.827 Linear Systems Analysis through State Variable and Transform Techniques (4 q.h. credits)**

Offered to day students only. Includes the material given in 3.825 and 3.826, Linear Systems Analysis II and III. *Prep. Bachelor of Science degree in Electrical Engineering and 3.824, Linear Systems Analysis I or equivalent.*

Fall and winter quarters

### **3.830 Network Synthesis I-A**

Matrix circuit analysis including m-port parameter systems. Positive-real functions. Energy functions. Driving-point synthesis techniques for LC, RC, and RL networks. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.* Fall, winter, and spring quarters

### **3.831 Network Synthesis I-B**

Driving-point synthesis of RLC networks. Properties of two-port networks. Two-port synthesis, including the parallel ladder realization. Lattice synthesis. *Prep. 3.830, Network Synthesis I-A.* Fall, winter, and spring quarters

### **3.832 Network Synthesis I (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.830, Network Synthesis I-A and 3.831, Network Synthesis I-B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.* Fall and spring quarters

### **3.833 Network Synthesis II**

Scattering, immittance, and hybrid formalisms for linear networks; state-space formulation and techniques for time-invariant and time-varying networks; introduction to passive n-port synthesis. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.* Fall quarter

### **3.834 Advanced Network Theory I**

General realizability of linear lumped and distributed systems; synthesis of reciprocal and non-reciprocal n-port networks; lossless microwave multi-port junctions; stability characterizations of active networks; theory of linear active multi-port networks. *Prep. 3.833, Network Synthesis II.* Winter quarter

### **3.835 Advanced Network Theory II**

Interrelationship between parts of network functions; theory of optimum broadband matching; approximation methods and insertion loss synthesis; analysis and synthesis of transmission line filters and equalizers; gain-bandwidth theory



of negative resistance devices including tunnel diodes, varactors, avalanche transit-time, and bulk-effect devices. *Prep. 3.834, Advanced Network Theory I.* Spring quarter

### **3.837 Topological Circuit Analysis and Linear Graphs**

Mathematical properties of the Kirchoff equations. Matrix and topological circuit analysis. Fundamentals of graph theory. Selected applications of graph theory in the fields of network synthesis, switching theory, and communication networks. *Prep. 10.9N2, Advanced Mathematics or equivalent.* Fall quarter

### **3.838 Nonlinear Circuit Analysis I**

Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Geometric analysis in second-order systems. Perturbation and averaging theory. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.* Winter quarter

### **3.839 Nonlinear Circuit Analysis II**

Linear, time-varying systems and their relationship to certain nonlinear problems. The WJKB approximation. The Hill and Mathieu Equations. Stability of nonlinear systems. Lyapunov Theory. Selected topics in nonlinear analysis according to group interest. *Prep. 3.838, Nonlinear Circuit Analysis I.* Spring quarter

### **3.840 Linear Active Circuits I-A**

Active networks are developed from device representation and appropriate circuit theory concepts. Topics included are application of flowgraphs and matrices to design and analysis, development of solid state device models, stability, integrated circuitry limitations and dominant pole analysis, and realization from open and short-circuit impedance concepts. These are applied to the realization, operation, and optimization of gainband-width products of wide-band amplifiers to obtain specific characteristics such as Butterworth and other functions. *Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II.* Fall quarter

### **3.841 Linear Active Circuits I-B**

The results of 3.840, Linear Active Circuits I-A, are extended to include narrow-band, band pass amplifiers, and feedback amplifier concepts. The effects of feedback upon gain, impedance noise, and stability are developed from return difference and ratio viewpoints utilizing open and short-circuit loop gain concepts. Consideration is given to the synthesis of driving point and transfer functions using active filters, negative impedance converters, and other basic building blocks. *Prep. 3.840, Linear Active Circuits I-A.* Winter quarter

### **3.842 Linear Active Circuits I (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.840, Linear Active Circuits I-A and 3.841, Linear Active Circuits I-B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II.* Fall and winter quarters

### **3.843 Linear Active Circuits II**

A continuation of the material covered in Linear Active Circuits I-A and I-B. Emphasis will be placed on feedback systems, including multiloop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. *Prep. 3.841, Linear Active Circuits I-B or 3.842, Linear Active Circuits I.* Spring quarter



**3.845 Active Network Synthesis**

Basic methods of active network synthesis are introduced through three commonly used approaches: feedback amplifier, negative impedance convertor, and gyrator; structures of Sallen and Key, Kuh, Linvill, Yanagisawa, Rohrer, Kinariwals, Sepress, and Calahan; consideration of the practical realization of NIC's and gyrators, standard decomposition methods and sensitivity; work of Sandberg, Larky, Newcomb, Daniels, Horowitz, and Thomas. *Prep. 3.381, Network Synthesis I-B and 3.841, Linear Active Circuits I-B or equivalent.* Fall quarter

**3.853 Solid State Device Theory and Practice (4 q.h. credits)**

This course meets twice weekly. On one night there is a two hour lecture; on the other, a three hour lab. The course carries four quarter hours of credit.

A case method study of solid state devices with a laboratory tightly integrated with the classroom work. The methodology developed is fundamental to the discrete and integrated circuit technology. The classroom portion of the course is devoted to junction diode and bipolar transistor theory including the physics of achieving a given design. In the laboratory, the student designs, builds, and tests diodes and transistors to meet certain electrical characteristics. The devices achieved are seldom of commercial quality, but sufficient equipment is available in the laboratory to make practical device processing possible even for completely untrained personnel. *Prep. An undergraduate level background in electronics and semiconductor devices.* Fall quarter

**3.854 Solid State Theory and Practice (4 q.h. credits)**

The course is offered on the same basis as 03.853 and is a continuation of that course. The central topic is field effect transistors with appropriate design problems for the laboratory. *Prep. 3.853 Solid State Device Theory and Practice.* Spring quarter

**3.858 Characteristics and Models of Solid State Devices I (4 q.h. credits)**

Open to both day and evening students. Two two-hour evening sessions per week.

This two quarter sequence is designed to develop real insight into the operation of a broad range of semiconductor devices. First half of this quarter is devoted to important topics in the physics of semiconductors to provide the background necessary for device analysis. Second half of the quarter is devoted to analysis of fundamental building-block units of which devices are made including the PN junction, the ohmic contact, and the Schottky barrier. Each is examined under reasonable extremes of bias and temperature to establish the electrical behavior expected from such elementary units. A detailed analysis of the bipolar transistor. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.* Winter quarter

**3.859 Characteristics and Models of Solid State Devices II (4 q.h. credits)**

Open to both day and evening students. Two two-hour evening sessions per week.

A continuation of 3.858. First half of this quarter is devoted to the metal-oxide-semiconductor interface, its influence on the behavior of real junctions, and the various realizations of the field-effect transistor. A detailed analysis of the per-

formance of FET's will permit a critical comparison of field effect and bipolar transistors. Second half is devoted to solid state microwave devices; devices that are both unique to microwave applications and the relevant low frequency elements which require somewhat different analysis at microwave frequencies. An examination of noise in semiconductor devices. *Prep. 3.858, Characteristics and Models of Solid State Devices I or equivalent.* Spring quarter

### **3.860 Pulse Processing I**

The principles and techniques of pulse-forming and pulse-processing circuits, basic radar, television, digital computation, pulse modulation systems, and data-processing systems. Wave shaping circuits, logic circuits, switching circuits, digital devices, and time base generators will be covered. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and II.* Winter quarter

### **3.861 Pulse Processing II**

Continuation of 3.860, Pulse Processing I, to include digital filters and correlators, pulse transformers, memory devices, and linear delay devices. *Prep. 3.860, Pulse Processing I.* Spring quarter

### **3.865 Radar Systems I**

Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout. *Prep. Background in probability and Fourier analysis.* Fall quarter

### **3.866 Radar Systems II**

Continuation of 3.865, Radar Systems I, a further consideration of systems aspects. The principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking problems. *Prep. 3.865, Radar Systems I.* Winter quarter

### **3.867 Radar Systems III**

Advanced topics in radar engineering including modern tracking techniques, waveform synthesis, multifunction array radar techniques, and selected topics in radar sensing techniques and devices. *Prep. 3.866, Radar Systems II.* Spring quarter

### **3.871 Space Communications Systems I**

Primarily concerned with space oriented communications. Antenna gain, space loss, cosmic and atmospheric noise, polarization loss and receiver noise temperature will be discussed as factors influencing the system signal-to-noise ratio. Contemporary signal modulation and processing systems will be introduced in order to determine signal spectrum and noise power at the output of the intermediate frequency receiver. *Prep. Background in Probability and Fourier Analysis.* Fall quarter

### **3.872 Space Communications Systems II**

Primarily concerned with the theoretical aspects of analogue modulation systems used in radio telemetry and space communications. First and second threshold effects will be discussed in conjunction with signal-to-noise considerations for

amplitude and angle modulated systems. Treatment of frequency feedback and phase-lock loops will be included in the discussion of frequency modulation and detection. Frequency division multiplexing will include sub-carrier pre-emphasis and comparative performance figures for SSSC/FM and FM/FM. *Prep. 3.871, Space Communications Systems I or 3.900, Communication Theory—Introduction A.*  
Winter quarter

### **3.873 Space Communications Systems III**

Continuation of techniques of 3.872 to cover digital modulation systems and time division multiplexing. Adaptive sampling, aliasing, and interpolation will be discussed along with PAM/FM. Pulse code modulation systems utilizing frequency and phase shifted carriers will be compared under noise conditions. Treatment will be given to the use of codes with special correlation, modulation by sequences, and phase-coherent communication. *Prep. 3.872, Space Communications Systems II.*  
Spring quarter

### **3.875 Electromagnetic Theory A**

Maxwell's equations and related electromagnetic laws and relations; basic properties of matter; electromagnetic potentials; the scalar and vector Poisson, D'Alembert, and Helmholtz equations; Green's functions; both mathematical and physical aspects of the theory and their relation to engineering applications. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III, Advanced Calculus, and Vector Analysis.*  
Fall quarter

### **3.876 Electromagnetic Theory B**

Basic radiation phenomenon including retarded potentials, radiation from moving charges, electromagnetic energy, and energy-related theorems. Propagation of plane waves in media with real and complex constitutive parameters. Fundamental theory of guided waves. *Prep. 3.875, Electromagnetic Theory A.*  
Winter quarter

### **3.877 Electromagnetic Theory (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.875 and 3.876, Electromagnetic Theory A and B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III.*  
Winter and spring quarters

### **3.878 Advanced Electromagnetic Theory A**

More advanced approaches to problems in electromagnetic theory of interest to electrical engineers — for example: waveguide, antennas, diffraction, and scattering; approximation techniques for obtaining useful solutions of field theory problems including integral equation, perturbation, and variational techniques. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.*  
Spring quarter

### **3.879 Advanced Electromagnetic Theory B**

Special relativity and relativistic electrodynamics. Radiation from moving charges. Statistical concepts and propagation in random media. Introduction to magnetohydrodynamics and plasma physics. *Prep. 3.878 Advanced Electromagnetic Theory A.*  
Fall quarter

**3.880 Microwave Theory**

Propagation of electromagnetic waves on periodic structures. Propagation on a helix. Waves on electron beams. Coupled-mode theory. Travelling wave devices. Propagation in anisotropic media. Ferrite devices. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.* Spring quarter

**3.881 Microwave Circuits I**

Review of microwave circuit theorems; scattering matrices and applications; eigenvalue problem; symmetrical and miscellaneous junctions; applications of 3-db couplers; polarizers, phase shifters and attenuators; non-reciprocal and ferrite devices. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.* Winter quarter

**3.882 Microwave Circuits II**

One-port resonant cavity; transmission cavity; analysis and synthesis of microwave filters; travelling-wave resonators; periodically loaded lines; selected microwave system considerations. *Prep. 3.881, Microwave Circuits I.* Spring quarter

**3.883 Advanced Electromagnetic Theory (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.878 and 3.879 — Advanced Electromagnetic Theory A and B. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.* Spring quarter

**3.885 Antennas and Environmental Sensors**

Fundamental theory of the transient and steady state operation of radiating devices with emphasis on wire type antennas — although more complex structures will also be studied; use of antennas for environmental probes and for mapping and measuring the resources of the earth; remote sensing from radiating structures; use of computers in solving antenna problems. *Prep. 3.876, Electromagnetic Theory B or 3.877, Electromagnetic Theory.* Spring quarter

**3.889 Numerical Methods and Computer Applications III**

A continuation of 3.897 with linear and dynamic programming, steepest descent and simplex methods, with application to nonlinear functions in n-dimensional space; eigenvalues and eigenvectors of matrices; approximate location of eigenvalues; stability; Routh-Hurwitz criterion; more specialized techniques including the fast Fourier transform, digital simulation of analog computation, system modelling, etc. *Prep. 3.897, Numerical Methods and Computer Applications II.* Spring quarter.

**3.890 Electromagnetic Wave Propagation I**

Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magneto-ionic theory. Propagation of waves in a spatially varying medium. Ray theory. *Prep. 10.9N2, Advanced Mathematics or equivalent.* Winter quarter

**3.891 Electromagnetic Wave Propagation II**

Application of the theory of the oblique incidence of radio waves on the ionosphere, including the effects of the presence of the geomagnetic field, to radio

communications. The interpretation of ionograms. Path prediction and field strength computations. Absorption. Top side soundings. Incoherent thermal scatter. Ionospheric irregularities and motions, and their study by space and frequency diversity techniques and other methods. *Prep. 3.890, Electromagnetic Wave Propagation I.* Spring quarter

### **3.892 Introduction to Digital Computer Programming**

Analysis of assorted problems of differing types and discussion of potential solution methods; transformation of chosen solution methods into detailed flow charts; principles of computer programming: logical decision trees, loops, arrays, subroutines, internal checks, error handling, input, output, and the use of library routines; implementation of these principles using the FORTRAN IV language including its advanced features; principles of program testing and the circumvention of language restrictions. (Not open to those who have completed 3.970, Digital Computer Programming I.) *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

### **3.893 Digital Computer Programming I**

Review of FORTRAN IV and its advanced features; binary number system; description of a machine and its language; addressing techniques, indirect and indexed addressing, input/output instructions and devices; introduction to some of the topics of 3.894. (Not open to those who have completed 3.970, Digital Computer Programming I.) *Prep. Bachelor of Science degree in Engineering or Science and knowledge of FORTRAN IV, ALGOL or PL/I.* Fall quarter

### **3.894 Digital Computer Programming II**

First half of a two quarter sequence on operating systems and language processors. Topics covered in the sequence include: data and program structures, list and string processing, sorting, multiprogramming, multiprocessing, and real-time systems; re-entrant coding and recursion; storage allocation, segmentation, virtual memory, memory protection, management of multi-level storage; assemblers, interpreters, and compilers; nested and recursive macros; syntactic analysis, instruction formats, and code generation; libraries; special purpose computers, digital controllers. (Not open to those who have completed 3.971, Digital Computer Programming II.) *Prep. 3.893, Digital Computer Programming I.* Winter quarter

### **3.895 Digital Computer Programming III**

Continuation of 3.894. *Prep. 3.894, Digital Computer Programming II.*

Spring quarter

### **3.896 Numerical Methods and Computer Applications I**

Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff errors and cumulative errors; difference and summation calculus; roots of polynomials and nonlinear functions; orthogonal functions including polynomials, least squares, and Chebyshev approximation of functions; systems of algebraic equations, matrix notation, and machine implementation; inversion of matrices including iterative methods; sparse matrix techniques. *Prep. Bachelor of Science in Engineering, Mathematics, or Physics; a working knowledge of FORTRAN.*

Fall quarter

**3.897 Numerical Methods and Computer Applications II**

Interpolation; numeric quadrature; numeric integration of ordinary differential equations including predictor-corrector methods; stiff dynamic equations, partial differential equations, approximations, boundary value problems. A continuing course in this sequence is 3.889. *Prep. 3.896, Numerical Methods and Computer Applications I.* Winter quarter

**3.898 Combinatorial Methods and Optimization Techniques I**

An introductory course in applied combinatorial mathematics which treats selected topics in enumerative analysis and optimization techniques. Illustrative applications will be given in the areas of computer science, information processing, operational research, and controls. *Prep. Bachelor of Science degree.* Fall quarter

**3.899 Combinatorial Methods and Optimization Techniques II**

A continuation of course 3.898. *Prep. 3.898, Combinatorial Methods and Optimization Techniques I.* Winter quarter

**3.900 Communication Theory — Introduction A**

The first course in the communication theory sequence which is to present an engineering analysis of statistical communication problems. Designed to provide the basic tools for the study of linear optimum filtering theory, information theory, and detection theory, which are the subject matters of subsequent courses. Particular topics include probability theory and random variables; correlation functions and power spectra; description and analysis of signals and noise as stochastic processes. *Prep. 3.978, Precis of Modern Electrical Engineering IV or equivalent.* Fall, winter, and spring quarters

**3.901 Communication Theory — Introduction B**

Continuation of course 3.900, Communication Theory — Introduction A. It deals with: Karhunen-Loeve expansion; Wiener and Kalman filtering; matched filtering and introduction to detection theory. *Prep. 3.900, Communication Theory — Introduction A.* Fall, winter, and spring quarters

**3.902 Communication Theory — Introduction (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.900, Communication Theory — Introduction A and 3.901, Communication Theory — Introduction B. *Prep. Knowledge of Laplace Transforms or Complex Variables.* Fall, winter, and spring quarters

**3.903 Communication Theory — Information Theory and Coding A**

Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems. *Prep. 3.900, Communication Theory — Introduction A or 3.902, Communication Theory — Introduction or Probability.* Winter quarter

**3.904 Communication Theory — Information Theory and Coding B**

Continuation of 3.903, Communication Theory — Information Theory and Coding A. The theory of coding and decoding for efficient and reliable communication. Particular subjects include the derivation of theoretical bounds of error in coding,



methods of constructing algebraic and probabilistic codes, and decoding techniques. Some knowledge of elementary aspects of modern algebra is desirable but not necessary. *Prep. 3.903, Communication Theory — Information Theory and Coding A.* Spring quarter

**3.905 Communication Theory — Information Theory and Coding** (4 q.h. credits)  
Offered only to day students. Includes the material given in 3.903 and 3.904, Communication Theory — Information Theory and Coding A and B. *Prep. 3.900, Communication Theory — Introduction A or Probability.* Spring quarter

**3.906 Communication Theory — Detection and Estimation Theory A**  
This course presents the classical theory of signal detections and estimation. Particular topics include: likelihood ratio tests for detection of known or random signals; calculation of error probabilities and the signal selection problem. *Prep. 3.901, Communication Theory — Introduction B or 3.902, Communication Theory Introduction.* Winter quarter

**3.907 Communication Theory — Detection and Estimation Theory B**  
This course is a continuation of 3.906 stressing application of the theory. Particular topics include: synthesis of an adaptive receiver; data reduction to several discriminants; ambiguity function; estimation of angle modulated signals; and Kalman-Wiener filtering. *Prep. 3.906, Communication Theory — Detection and Estimation Theory A.* Spring quarter

**3.908 Special Topics in Communication Theory**  
This course is designed to cover other aspects of communication theory of current interest that have not been covered in previous courses. The subject matter may change from year to year. Subjects to be given in 1971–72 are:

**Fall Quarter — Data Transmission**

Deals with the theoretical and practical aspects of digital data transmission in the presence of channel distortion and additive noise including: the characterization of physical channels, signal design techniques, and Nyquist criteria; adaptive equalization; diversity reception techniques; and error rate performance. *Prep. 3.907 or 3.909, Communication Theory*

**Winter Quarter — Visual Image Processing**

Application of communication and information theoretic techniques to visual image processing including: efficient coding; transmission and reconstruction of visual source material; computer processing of digital images; image enhancement techniques; picture properties; descriptions and languages with application to pattern recognition. *Prep. 3.907 or 3.909, Communication Theory*

**Spring Quarter — Digital Communications**

Deals principally with four aspects of digital communications properties of digital sequences, mathematical theory of digital orthogonal codes, space communications and problems in synchronization for digital communications. *Prep. 3.904 or 3.905, Communication Theory*

**3.909 Communication Theory — Detection and Estimation Theory** (4 q.h. credits)  
Offered only to day students. Includes the material given in 3.906 and 3.907,

Communication Theory — Detection and Estimation Theory A and B. *Prep. 3.901, Communication Theory — Introduction B or 3.902, Communication Theory Introduction.* Winter quarter

### 3.910 Nonlinear Systems I

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. *Prep. An undergraduate course in Signals and Systems and 3.900, Communication Theory — Introduction A or equivalent.* Fall quarter

### 3.911 Nonlinear Systems II

Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. *Prep. 3.910, Nonlinear Systems I and either 3.901, Communication Theory — Introduction B or 3.902, Communication Theory — Introduction.* Winter quarter

### 3.912 Nonlinear Systems III

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. *Prep. 3.911, Nonlinear Systems II.* Spring quarter

### 3.914 Geometric Optics I

The fundamental laws of image formation — thin and thick lenses, Gaussian optics, and ray tracing; third order aberration theory — wave aberration and the basic elements of photometry, optical design, and optics fabrication; the eye as a detector; applications to instrument design such as microscopes and telescopes. *Prep. 10.8A4, Advanced Mathematics or 3.823, Mathematical Techniques in Electrical Engineering or equivalent.* Spring quarter

### 3.915 Geometric Optics II

Fundamental laws of image formation are examined in more detail. In the first part theory is presented which leads from Maxwell's Equations to the general laws of image formation — including third order aberrations. In the second part theory of image formation is used to analyze the performance of various optical systems; limitations due to image aberrations are determined; and those optical design concepts which are used to correct for the different aberration effects are discussed. *Prep. 3.914, Geometric Optics I.* Fall quarter

### 3.916 Physical (wave) Optics I

This two quarter sequence covers: optical diffraction and imaging problems as linear systems; necessary tools of Fourier Analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory — including Fresnel and Fraunhofer



diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prep. 3.915, Geometric Optics II or equivalent.*

Winter quarter

### **3.917 Physical Optics II**

Continuation of 3.916. *Prep. 3.916, Physical Optics I.*

Spring quarter

### **3.918 Experimental Optics and Image Evaluation I**

Should be taken concurrently with 3.915, Geometric Optics II.

1 hour lecture, 2 hours laboratory.

Fall quarter

### **3.919 Experimental Optics and Image Evaluation II**

Should be taken concurrently with 3.916, Physical (wave) Optics I.

1 hour lecture, 2 hours laboratory.

Winter quarter

### **3.920 Experimental Optics and Image Evaluation III**

Should be taken concurrently with 3.917, Physical Optics II.

1 hour lecture, 2 hours laboratory.

Spring quarter

The laboratory course provides practical experience in experimental optics to supplement the theory developed in the geometrical and physical optics lectures. Topics include: geometrical properties of lenses, aberrations, and resolution measurements; diffraction effects in optics and in lens systems; interferometric techniques applied to precise optical measurements and to image evaluation. Optical transfer function, spatial optical filtering and Fourier transformation concepts are studied in the laboratory; investigation of holographic techniques and the coherence of light.

### **3.921 Optical Properties of Matter I**

Optics of crystals; classification and effects of crystal symmetry on crystal properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, non-linear optics. *Prep. 11.801, Introductory Modern Physics or equivalent.*

Fall quarter

### **3.922 Optical Properties of Matter II**

Introduction to the quantum theory of matter with application to optics; absorption and emission of radiation; quantum description of optical propagation in matter; quantum statistics of fields; laser models and application of the theory to selected experiments and current investigations. *Prep. 3.921, Optical Properties of Matter I.*

Winter quarter

### **3.923 Optical Properties of Matter III**

Continuation of 3.922. *Prep. 3.922, Optical Properties of Matter II.*

Spring quarter

### **3.924 Advanced Optics Laboratory and Current Developments**

Special topics in modern optics and optical techniques requiring the presentation of a paper by participants at termination of the course. *Prep. Consent of the Director of the Electro-Optics Program.* Offered by special arrangement

Additional courses on the optics sequence are 3.980, 3.981, 3.982, 3.983, and 3.984.

**3.925 Power Circuit Analysis I**

Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction to symmetrical components; short circuits on systems with a single power source. *Prep. Bachelor of Science degree in Electrical Engineering.* Fall quarter

**3.926 Power Circuit Analysis II**

This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems; 2-phase systems. *Prep. 3.925, Power Circuit Analysis I.* Winter quarter

**3.927 Power Circuit Analysis III**

This course is a continuation of 3.926, Power Circuit Analysis II. Introduction to Clarke components and applications in analysis of asymmetrical systems and faults; transmission line theory; protective relaying; fundamentals of system stability. *Prep. 3.926, Power Circuit Analysis II.* Spring quarter

**3.928 Analysis of Power Systems (4 q.h. credits)**

Offered only to day students. This course is designed to provide the basic material, including special mathematical techniques, applicable to the solution of problems associated with power systems. The sequence-impedance characteristics of various power-system elements are investigated with emphasis on application rather than design. Abnormal situations including simultaneous faults and system transients are treated in depth, making use of Clarke components and modified Clarke components as well as symmetrical components. Polyphase transmission line theory, system protection and system stability are introduced and discussed briefly. *Prep. Bachelor of Science degree in Electrical Engineering.* Fall quarter

**3.930 Power System Planning**

Engineering and economic aspects underlying system development and planning. Probability methods of determining installed and spinning-reserve requirements. Mathematical models of system operation for production-costing studies. Detailed examples include economic comparison of nuclear and fossil-fired plants, the role of pumped-hydro generation, power pooling, and coordinated planning of interconnected systems, and the functions of high-voltage and EHV transmission in planning and operation. *Prep. 3.925, Power Circuit Analysis I.* Spring quarter

**3.931 Power System Planning (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.930 but with more extensive and in depth coverage. *Prep. 3.928, Analysis of Power Systems or equivalent.* Spring quarter

**3.932 Power Systems Protection**

Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods

of protective relaying; load shedding, breaker failure, and computer applications to system protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

Fall quarter

### **3.933 Power System Transients**

Transients in power systems due to system switching, lightning, or faults. Traveling wave phenomena; insulation coordination; overvoltages due to disturbances on the system; surge protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*

Winter quarter

### **3.934 Power System Stability**

Role of synchronous machines; steady-state and transient stability; inter-system considerations; methods of improving system stability. *Prep. 3.928, Analysis of Power Systems or equivalent.*

Spring quarter

### **3.935 Computers in Power Systems I**

Techniques are developed for solving the electric load flow problem using a digital computer; steady-state performance equation of a power system network is formed from the primitive network and incidence matrices; equation is solved using iterative approaches, including Gauss-Seidel and Newton-Raphson approaches; practical features of load-flow programs; introduction to system state estimation as time permits. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.*

Fall quarter

### **3.936 Computers in Power Systems II**

Digital computer methods for solving the short-circuit problem; bus impedance matrix as a system model, methods for forming this matrix directly and by transformation; calculations of bus voltages and line currents for both three-phase and single-phase to-ground faults; requirements of an operating short-circuit program. *Prep. 3.935, Computers in Power Systems I.*

Winter quarter

### **3.937 Computers in Power Systems III**

The transient and dynamic response of a power system to large disturbances; the necessary modifications to the steady-state model; numerical methods for solving differential equations are treated in detail and applied as a digital computer solution to the transient stability problem; extension of the basic stability solution to modern dynamic representation. *Prep. 3.936, Computers in Power Systems II.*

Spring quarter

### **3.940 Electric Machinery Theory I**

Review of electromagnetic theory as applied to electrical machines; in depth analysis of the a-c induction machine; generalized machine and d-q transformations. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precipos of Modern Electrical Engineering I, II, and III.*

Fall quarter

### **3.941 Electric Machinery Theory II**

Analysis of the principles of operation of synchronous machines with special reference to dq and symmetrical components; consideration of the transient behavior of the machine. *Prep. 3.940, Electric Machinery Theory I.*

Winter quarter

**3.942 Electric Machinery Theory III**

Dynamic behavior of machines; comprehensive treatment of the problem of stability as applied to electric machinery. *Prep.* 3.941, *Electric Machinery Theory II*.  
Spring quarter

**3.943 Advanced Power Laboratory**

Offered to day students only. In depth investigations of the steady-state and dynamic modes of operation of rotating machines. Polyphase rectification and control circuits. Experimentation in other related power areas. *Prep.* *Bachelor of Science degree in Electrical Engineering*.  
All quarters

**3.944 Special Topics in Power**

Offered to day students only. (Part-time students may enroll in this course only by special arrangement.) Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prep.* *Permission of instructor*.  
All quarters

**3.950 Systems Analysis I-A**

Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing. Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation. *Prep.* *Bachelor of Science degree in Engineering or Science*.  
Fall quarter

**3.951 Systems Analysis I-B**

Linear programming; transportation problem, graphical representation. Simplex method, concept of duality and its use. Fundamental concepts in game theory. Solution of rectangular games. Pure and mixed strategies, maximum and min-max principle. Zero and non-zero-sum games, infinite games. Transformation of games into linear programming problems. Other methods of solving competitive-situation problems. *Prep.* 3.950, *Systems Analysis I-A*.  
Winter quarter

**3.952 Systems Analysis II**

Various methods of optimization of deterministic systems will be studied. Emphasis will be placed on steepest-descent and dynamic-programming methods. Examples from the fields of electrical, mechanical, and aerospace technology will be considered. *Prep.* 10.8A4, *Advanced Mathematics* or 10.9N2, *Advanced Mathematics*.  
Spring quarter

**3.953 Systems Analysis III**

Optimization of stochastic systems from the point of view of Bayesian statistics. Applications to Markov processes. Least-square estimation theory and Kalman filter theory. Statistical decision problems for linear and nonlinear problems. *Prep.* 3.950, *Systems Analysis I-A*, 3.952, *Systems Analysis II*, 10.8G1, *Probability or equivalent*.  
Fall quarter

**3.954 Systems Analysis (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.950 and 3.951 — Systems Analysis I-A and I-B. *Prep.* *Bachelor of Science degree in Engineering or Science*.  
Spring quarter

**3.957 Control Theory I-A — Analysis**

Transient performance of linear feedback control systems for deterministic inputs. Block diagram representation and computer simulation of typical systems. Discussion of stability criteria. Development and application of root-locus and Nyquist methods for complementary time and frequency domain analysis. *Prep. Knowledge of transient analysis and Laplace transforms.* Fall quarter

**3.958 Control Theory I-B — Synthesis**

Comparison of several compensation configurations for both static and dynamic performance criteria. System design using root-locus and Bode-Nichols methods. Discussion of pole-zero synthesis techniques and consideration of the multi-input problem. Practical aspects of system design and review of component technology. *Prep. 3.957, Control Theory I-A — Analysis or equivalent* Winter quarter

**3.959 Control Theory I — Analysis and Synthesis (4 q.h. credits)**

Includes the material given in 3.957, Control Theory I-A — Analysis and 3.958, Control Theory I-B — Synthesis. Open to qualified undergraduate students. *Prep. Knowledge of transient analysis and Laplace transforms.* Fall quarter

**3.960 Control Theory II-A — Nonlinear Systems**

Analog and digital simulation of nonlinear system problems. Discussion of describing function and phase plane analysis techniques. Introduction to the methods of Liapunov. Design of intentionally nonlinear systems including comparison of compensation schemes; discussion of adaptive control systems. *Prep. 3.958, Control Theory I-B — Synthesis or 3.959, Control Theory I — Analysis and Synthesis or equivalent.* Spring quarter

**3.961 Control Theory II-B — Sampled-Data Systems**

Treatment of linear sampled-data control systems by means of the z-transform. Development of methods for analysis and synthesis of control systems with digital components and sampled-data inputs. Discussion of related topics including difference equations and digital filtering. *Prep. 3.958, Control Theory I-B — Synthesis or 3.959, Control Theory I — Analysis and Synthesis or equivalent.* Fall quarter

**3.962 Control Theory II — Nonlinear and Sampled-Data System (4 q.h. credits)**

Offered only to day students. Includes the material given in 3.960 Control Theory II-A and 3.961, Control Theory II-B. *Prep. 3.958, Control Theory I-B — Synthesis or 3.959, Control Theory I — Analysis and Synthesis or equivalent.* Winter quarter

**3.963 Control Theory III-A — Optimal Control**

Discussion of the optimal control problems with reference to aerospace and process control applications. Formulation of problem in terms of state variables. Variational calculus development of the maximum principle. Numerical solutions by dynamic programming and steepest-descent algorithms. *Prep. 3.826, Linear Systems Analysis III or 3.827, Linear Systems Analysis.* Winter quarter

**3.964 Control Theory III-B — Stochastic Systems**

Statistical models for random inputs encountered in the operation of control systems. Filtering and prediction, correlation functions and spectral densities.

Optimum design for nonstationary random processes. Analog and digital simulation for system design. *Prep. 3.826, Linear Systems Analysis III or 3.827, Linear Systems Analysis.* Spring quarter

### **3.965 Control Theory III — Optimal Control and Stochastic Systems**

Offered only to day students. Includes the material given in 3.963, Control Theory III-A — Optimal Control and 3.964, Control Theory III-B — Stochastic Systems. *Prep. 3.826, Linear Systems Analysis III or 3.827, Linear Systems Analysis.* Spring quarter

### **3.967 Switching Circuits I**

Basic relay networks will be treated by the methods of switching algebra. Combinational, sequential, and counting circuits will be given as well as the theory of error detecting and translating circuits. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

### **3.968 Switching Circuits II**

Application of the material covered in 3.967, Switching Circuits I. This includes work with iterative networks, sequential circuits and special coding techniques. *Prep. 3.967, Switching Circuits I.* Winter quarter

### **3.972 Electronic Digital Computers I**

The structural aspects of modern digital computer design, basic elements of a digital computer system, sequential networks, elementary machines, essential features of the central processor, fixed and floating point, arithmetic operations; serial parallel combinations. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

### **3.973 Electronic Digital Computers II**

Essential features of automatic programming; types of memories; organization, cycle time and addressing; levels of storage capacity, operating speed and cost/bit; special function memories; structural design of a general-purpose computer: instruction formats and repertoires, program sequencing, control of data and instruction flow; execution of several types of instructions; software-hardware interaction. *Prep. 3.972, Electronic Digital Computers I.* Winter quarter

### **3.974 Electronic Digital Computers III**

Input-output devices, Hybrid computation, analog to digital and digital to analog conversion methods; digital data transmission; techniques for mass storage; special-purpose computers; the digital differential analyzer, principle of operation, design, solutions of certain differential equations; different types of special purpose computers; effects of system and component constraints on storage density. *Prep. 3.973, Electronic Digital Computers II.* Spring quarter

### **3.975 Precis of Modern Electrical Engineering I**

*Prep. Bachelor of Science degree in Engineering or Science plus knowledge of matrix algebra.* Fall quarter

### **3.976 Precis of Modern Electrical Engineering II**

*Prep. Bachelor of Science degree in Engineering or Science.* Winter quarter



**3.977 Precis of Modern Electrical Engineering III**

*Prep. Bachelor of Science degree in Engineering or Science.* Spring quarter

**3.978 Precis of Modern Electrical Engineering IV**

*Prep. Bachelor of Science degree in Electrical Engineering or Science.*

Spring quarter

The preceding four precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their Bachelor's degree in electrical engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, Part III with field theory from the engineering viewpoint, and Part IV with communication theory.

**3.979 Electronic Digital Computers (4 q.h. credits)**

This course, offered to day students, embodies the material in 3.972 and 3.973—Electronic Digital Computers I and II. *Prep. Bachelor of Science degree in Engineering or Science.* Fall and winter quarters

**3.980 Optical Instrumentation Design Concepts**

An introduction to the design of optical instrumentation. Principles and basic concepts rather than a rundown of known optical systems. In sequence the topics are: introduction, mechanical shock and vibration, kinematic designs, application of third order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design, examples and exercises. *Prep. 3.914 and 3.915, Geometric Optics I and II.*

Spring quarter

**3.981 Radiometry and Photometry**

Detailed analysis of the generation and detection of radiation in the visible region of the electromagnetic spectrum; basic radiation laws, natural and artificial radiation sources and their characteristics; various types of detectors and their associated electronic circuits; treatment of the noise problems associated with optical detectors; applications of photometric techniques as they have become available for laser range finders, low light level imaging systems and display systems. *Prep. 3.917, Physical Optics II.*

Winter quarter

**3.982 Infrared and Detector Theory**

Topics on the generation and detection of optical radiation in the infrared region of the electromagnetic spectrum; basic radiation laws and various detection schemes; special emphasis on noise problems which are characteristic of infrared detector systems; modern applications such as IR imaging systems, thermal mapping and the like. *Prep. 3.981, Radiometry and Photometry.*

Spring quarter

**3.983 Physical Optics III**

The third in a series covering current topics of interest in this field and optical instrumentation. Application of coherence phenomena to optical instrumentation

such as microdensitometers, microscopes, viewers, cameras, spectrophotometric and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical application of laser optics. *Prep. 3.917, Physical Optics II.* Fall quarter

### **3.984 Analytical and Control Instrumentation**

Survey of optical instrumentation employed in analysis and control situations; modern methods of spectrometry and interferometry; optimization of analytical systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prep. 3.983, Physical Optics III.* Winter quarter

### **3.985 Fundamentals of Automatic Digital Machines I**

Study of theoretical models of computation; finite state machines; preparation of state diagrams; linear expressions; deterministic and non-deterministic machines; operations on sets of sentences, regular expressions; Turing machines; digital representation of information. *Prep. 3.972, Electronic Digital Computers I or equivalent.* Fall quarter

### **3.986 Fundamentals of Automatic Digital Machines II**

Principles of digital information processing systems with emphasis on the stored program synchronous computer. Description of digital systems, review of digital computer development; essential features of automatic programming; basic techniques for data manipulation, instruction formats and repertoires; elementary machines; special and general purpose computers; modular system organization. *Prep. 3.985, Fundamentals of Automatic Digital Machines I.* Winter quarter

### **3.987 Fundamentals of Automatic Digital Machines III**

Review of automata theory and computing machines; coding systems; study of theoretical models of computation; finite state machines; deterministic and non-deterministic finite automata; one way and two way tape machines; acceptors; equivalencies; preparation of state diagrams; linear expressions; universal Turing machines; decidability; Post, Church, and Senu-Thue systems; language development, syntax and semantics of programming languages; syntax directed compilers; translation procedures. *Prep. 3.986, Fundamentals of Automatic Digital Machines II.* Spring quarter

### **3.988 Special Topics in Computer Science**

Aspects of Computer Science not covered in other courses. The subject matter may change from year to year. The subjects to be given in 1971-72 are:

Fall quarter

Digital Filtering I

*Prep. 3.824, Linear Systems Analysis I or equivalent.*

Winter quarter

Digital Filtering II

*Prep. Bachelor of Science degree in Electrical Engineering or consent of instructor.*

Digital Filtering I and II

Representation of discrete signals and systems; z-transforms and discrete Fourier transforms; difference equations and state space representation of



discrete systems; algorithms for fast Fourier transforms e.g., Cooley-Tukey, Sande-Tukey, etc. Radix two, four, and arbitrary algorithms; digital filter analysis design; digital spectra, smoothing techniques, spectral windows; effects of quantization truncation and parameter inaccuracies; Kalman filtering; system performance in the presence of noise; applications to signal processing problems and the solution of partial differential equations.

Spring quarter

### **Multiprocessing Systems**

Historical summary and current design trends; performance goals in multiprocessing and multiprocessing, basis for multiprocessing; major parameters in system performance measurements; hypothetical general-purpose computer models; abstract programs and memory allocations; theoretical concepts in the system design of multiple structures; performance evaluation of representative systems; system synthesis procedure. *Prep. 3.973, Electronic Digital Computers II or equivalent.*

### **3.989 Computer Peripherals**

Survey of various types of modern computer peripherals, systems considerations, displays (CRT; control units, editing features, graphics, etc.); mass storage (magnetic surfaces; flying heads, recording techniques, disks; file organization, search strategies, mass storage, software, etc.); communications terminals (modems, control procedures, store and forward, multiplexers, etc.); tape units (types, consideration of cost vs performance, tape labels and formats, magnetic recording on tapes, design features, etc.); future trends in peripherals. *Prep. Bachelor of Science degree in Electrical Engineering or related engineering or sciences.*

Spring quarter

### **3.990 Seminar I**

A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lecturers. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall and spring quarters

### **3.991 Seminar II**

The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prep. 3.990, Seminar I.*

Winter and spring quarters

### **3.993 Doctoral Seminar I**

Two hours per week of presentation and discussion of topics at a level compatible with a doctoral program. Subject matter may cover a wide range of scientific and engineering fields. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*

Fall quarter

### **3.994 Doctoral Seminar II**

Continuation of 3.993, Doctoral Seminar I. (Only S or F grades will be assigned for this course.) *Prep. 3.993, Doctoral Seminar I.*

Winter quarter

### **3.995 Master's Thesis**

Analytical and/or experimental work conducted under the auspices of the department. *Prep. Bachelor of Science degree in Engineering or Science.*

Fall, winter, and spring quarters

**3.996 Doctoral Thesis**

Theoretical and/or experimental work conducted under the auspices of the department. *Prep. Passing of Ph.D. Qualifying Exam.*

Fall, winter, and spring quarters

**3.997 Doctoral Reading**

Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*

Fall, winter, and spring quarters

**3.998 Special Problems in Electrical Engineering**

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of dept. chairman.*

Fall, winter, and spring quarters

# industrial engineering and engineering management

## MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING Full-Time Program on the Cooperative Plan

### Admission

To be enrolled for graduate work leading to the degree of Master of Science in Industrial Engineering, applicants must have obtained a Bachelor of Science degree, with an acceptable quality of undergraduate work, in some engineering field from a recognized college or university.

The program as described below presupposes a background in the following areas: basic operations research, probability and statistics, engineering economy, data processing, and accounting. Recognizing that some applicants may be deficient in certain of these subjects, the intensive courses listed below are available. At the time of admission to the program the adviser will specify, on the basis of the applicant's transcript, those courses on the list which the applicant must complete satisfactorily to qualify for the degree. Such specified courses are to be completed as early in the program as scheduling will permit. The courses below carry graduate credit but a maximum of six quarter hours of credit from this group may be used as elective credit toward the degree.

Course	Credits
5.808 Basic Engineering Economy .....	2
5.810 Industrial Accounting for Engineers .....	2
5.900 Basic Operations Research .....	4
5.913 Data Processing for Engineers .....	2
10.8G1 Probability .....	2
	<hr/> 12

## Program

Forty quarter hours of academic work are required. Under the Cooperative Plan, students take academic work as outlined below in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The program may also be pursued on a continuous full time basis in one academic year with the sequence of courses established by the adviser.

A thesis of six quarter hours of credit is required. A faculty adviser will be appointed upon approval of the thesis topic.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
5.803 Industrial Organizations . . . . .	2	5.824 Case Studies in Industrial Engineering . . . . .	2
5.823 Advanced Production Analysis . . . . .	4	5.914 Advanced Operations Research . . . . .	4
5.992 Seminar . . . . .	2	10.9H1 Mathematical Statistics	4
5.809 Advanced Engineering Economy . . . . .	2	Electives . . . . .	4
Electives . . . . .	4		<hr/> 14
	<hr/> 14		

Third Academic Quarter	Credits
5.909 Systems Engineering and Analysis . . . . .	2
5.991 Thesis . . . . .	6
Electives . . . . .	4
	<hr/> 12

## Electives

The indicated 12 quarter hours of electives may be taken, with the approval of the adviser, from the course offerings of the graduate programs in engineering and mathematics for which the student has adequate preparation. Up to six quarter hours may be taken in other graduate programs subject to the approval of the director of the graduate school in which the course is offered.

**MASTER OF SCIENCE IN ENGINEERING MANAGEMENT****Part-Time Program****Admission**

To be enrolled for graduate study in engineering management, the applicant must have obtained a Bachelor of Science degree in an engineering field, with an acceptable quality of undergraduate work, from a recognized college or university. A limited number of applicants with a mathematics whose preparation is considered adequate may be permitted to Bachelor of Science degree in a closely related science or mathematics pursue this program and, upon its completion, qualify for the degree of Master of Science without specification.

Entrance to the engineering management program presupposes that students have had a basic course in each of the following areas: engineering economy, probability, engineering statistics, operations research (deterministic and stochastic), computer programming (compiler language), and accounting. Recognizing that some applicants may be deficient in certain of these subjects, the program offers the intensive courses listed below. At the time of admission to the program the adviser will specify, on the basis of the applicant's transcript, those courses on the list which the applicant must complete satisfactorily to qualify for the degree. Such specified courses are to be completed as early in the program as scheduling will permit. The courses below carry graduate credit but a maximum of six quarter hours of credit from this group may be used as an elective credit toward the degree.

<b>Courses</b>	<b>Credits</b>
5.808 Basic Engineering Economy .....	2
5.810 Industrial Accounting for Engineers .....	2
5.901 Basic Operations Research I (Deterministic) .....	2
5.902 Basic Operations Research II (Stochastic) .....	2
5.913 Data Processing for Engineers (FORTRAN) .....	2
5.950 Engineering Statistics I or 10.831 Probability .....	2
5.951 Engineering Statistics II .....	2
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**Program**

The program leading to the Master of Science degree in engineering management is designed for part-time students who may progress according to their abilities and the time available. The purpose of the program is to provide engineers the opportunity to expand their capabilities to assume managerial responsibility for technological activities in industrial and governmental organizations. Students who wish to concentrate their efforts in the field of computer systems may elect the computer systems option. Successful completion of this program will also lead to the degree of Master of Science in engineering management or Master of Science.

A minimum of 40 quarter hours of graduate level credit is required for the degree. To assure adequate preparation for management of technological activities, all students who do not elect the computer systems option must earn the minimum number of credits indicated in each of the five categories listed below:

Category	Minimum Credits
a. Management of Technology	8 including 5.801
b. Operations Research and Quantitative Techniques	8
c. Production Engineering	4
d. Financial Controls	4 including 5.830
e. Computer Technology	4
	<hr/> 28

The remaining 12 quarter hours required for the degree may be considered as free electives. These may be taken within the course offerings of this program or from any courses in graduate engineering and mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools subject to the approval of the adviser for this program and the director of the graduate school in which the course is offered. Students desiring courses in such subjects as economics, business law, labor relations, or marketing should consult the catalog of the Graduate School of Business Administration.

Courses in the five categories from which students must select to meet the indicated minimum total of 28 quarter hours of credit are as follows:

**a. Management of Technology**

(at least 8 q.h. including 5.801)

5.801 and 5.802 Analysis of the Industrial Enterprise I and II

5.812 Management of Technical Innovation

5.814 Development of Engineering Managers

5.815 Legal Aspects of New Technology

5.816 Industrial Psychology for Engineers

5.820 Personnel Administration for Engineers

5.841 Engineering Project Administration

**b. Operations Research & Quantitative Techniques**

(at least 8 q.h.)

5.903 Inventory Control and Production Planning

5.904 Queuing Theory and Its Applications

5.905 Analysis with Simulation

5.911 Linear Programming

5.912 Network Planning and Control

5.914 Advanced Operations Research

5.952 Design of Experiments

5.953 Statistical Decision Theory

3.952 and 3.953 Systems Analysis II and III  
 10.8G8 and 10.8G9 Stochastic Processes

### c. Production Engineering

(at least 4 q.h.)

5.806 Production Forecasting  
 5.817 Advanced Work Design  
 5.819 Human Factors in Man-Machine Systems  
 5.822 Value Analysis  
 5.954 Advanced Quality Control  
 5.955 Reliability and Maintainability Applications  
 5.956 Mathematical Theory of Reliability  
 5.957 Designing for Reliability

### d. Financial Controls

(at least 4 q.h. including 5.830)

5.805 Industrial Budgeting for Engineers  
 5.809 Advanced Engineering Economy  
 5.811 Cost Accounting for Engineers  
 5.830 and 5.831 Financial Management I and II

### e. Computer Systems

(at least 4 q.h.)

5.818 Management Information Systems  
 5.906 Introduction to Principles of Systems  
 5.907 Dynamics of Systems I  
 5.908 Dynamics of Systems II  
 5.916 Engineering Analysis Utilizing Data Processing  
 5.917 Information Retrieval Techniques  
 5.920 Computer Utility Systems  
 5.921 Advanced Programming  
 5.922 Devices and Techniques of Information Systems  
 3.894 Digital Computer Programming II

## Computer Systems Option

In addition to the courses required for entrance to the engineering management program, the following courses are required of students electing the computer systems option:

	Credits
5.801 Analysis of the Industrial Enterprise I .....	2
5.818 Management Information Systems .....	2
5.830 Financial Management I .....	2
5.905 Analysis with Simulation .....	2
5.916 Engineering Analysis Utilizing Data Processing ....	2
5.921 Advanced Programming .....	2
3.893 Digital Computer Programming I .....	2
3.894 Digital Computer Programming II .....	2

In addition to the above required courses, the student must earn the minimum number of credits in each of the three categories listed below:

Category	Minimum Credits
a. Management of Technology .....	2
b. Operations Research and Quantitative Techniques .	4
c. Production Engineering .....	2
	<hr/> 8

Of the remaining 16 quarter hours, at least ten quarter hours must be earned by electing courses from the following group:

- 3.972 Electronic Digital Computers I
- 3.973 Electronic Digital Computers II
- 3.974 Electronic Digital Computers III
- 3.985 Fundamentals of Automatic Digital Machines I
- 3.986 Fundamentals of Automatic Digital Machines II
- 3.987 Fundamentals of Automatic Digital Machines III
- 5.906 Introduction to Principles of Systems
- 5.907 Dynamics of Systems I
- 5.908 Dynamics of Systems II
- 5.909 Systems Engineering and Analysis
- 5.917 Information Retrieval Techniques
- 5.920 Computer Utility Techniques
- 5.922 Devices and Techniques of Information Systems

## DESCRIPTION OF COURSES

*All courses carry two quarter hours of credit unless otherwise noted. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.*

### 5.801 Analysis of the Industrial Enterprise I

A background for the practicing engineer, covering the various phases of operation within the industrial enterprise; history and growth; management selection and development; labor-management relations; product development and marketing; public relations and the corporate image. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

### 5.802 Analysis of the Industrial Enterprise II

The environment in which the industrial enterprise operates; modern planning and forecasting; meeting the technological advance; financial aspects within and without the company; the effect of the economic climate; community and government influences. *Prep. 5.801 Analysis of the Industrial Enterprise I.*

Offered yearly, all quarters

### 5.803 Industrial Organizations

An analysis of the purpose and functioning of organizations as the basic networks for goal satisfaction through coordination of effort, communication, and responsibility. The approach will be based on modern behavioral science concepts. *Prep. Admission to Program.* Offered yearly, days only, fall quarter



**5.805 Industrial Budgeting for Engineers**

Budgeting plans, programs, and reports for industry today; an introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis. *Prep. 5.810, Industrial Accounting or equivalent.* Offered yearly, fall quarter

**5.806 Production Forecasting**

Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. *Prep. 5.951, Engineering Statistics II or equivalent.* Offered yearly, spring quarter

**5.808 Basic Engineering Economy**

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques with continuous and discrete interest calculations. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

**5.809 Advanced Engineering Economy**

Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of cases and a major term project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prep. 5.808, Basic Engineering Economy or equivalent.*

Offered yearly, fall and winter quarters

**5.810 Industrial Accounting for Engineers**

Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical coverage of basic cost procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

**5.811 Cost Accounting for Engineers**

Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals. *Prep. 5.810, Industrial Accounting or equivalent.*

Offered yearly, winter quarter

**5.812 Management of Technical Innovation**

Analysis of the particular problems of managing research, development and engineering based on current developments in general management theory and the behavioral sciences; technical innovation as part of the overall organization; class discussion of cases and student term papers. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall and winter quarters

**5.813 Engineering Writing**

Principles for achieving a clear, readable style through appropriate word choice and modern concepts of sentence and paragraph structure; application and

evaluation of these principles in engineering proposals, reports, letters, and memos; practice in utilizing artwork; planning outlines; adapting to various reader levels and writing for publication; class analysis of student papers and great engineering literature. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

#### **5.814 Development of Engineering Managers**

Analysis of the problems faced by the engineer in the transition from individual contributor to engineering manager; the challenge of engineering management; analyzing what is their business and who are their customers; integrating profession and management objectives; developing guides for engineering managers, enabling them to examine their own work and performance, to diagnose their weaknesses, and to improve their effectiveness as well as the results of the enterprise. *Prep. 5.801, Analysis of the Industrial Enterprise I.*

Offered yearly, all quarters

#### **5.815 Legal Aspects of New Technology**

The relationship of laws and regulations to technical innovation and related corporate activities; emphasis on the patent and copyright systems; trade secrets; managing intellectual property as part of employer-employee relations; disposition of rights under federal contracts and grants. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall and spring quarters

#### **5.816 Industrial Psychology for Engineers**

A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

#### **5.817 Advanced Work Design**

Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, winter quarter

#### **5.818 Management Information Systems**

Development and critique of industrial information systems for management decision-making with emphasis on the use of electronic computers; case method used to provide a realistic environment for study of actual information system needs and techniques; examples developed in budgeting and accounting, forecasting, inventory and production control systems; introduction to application of analytical techniques such as systems analysis, mathematical and simulation models. *Prep. 5.810, Industrial Accounting and 5.913, Data Processing for Engineers or their equivalent.*

Offered yearly, fall and spring quarters

**5.819 Human Factors in Man-Machine Systems**

Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information — speech communications, man-machine dynamics, design of controls, layout of work places, and environmental effects on human performance. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

**5.820 Personnel Administration for Engineers**

Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies; modern methods of salary and wage administration; planning profitable relationships among company, supervisors, and employees. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, winter and spring quarters

**5.822 Value Engineering**

Value analysis from point of view of design, manufacturability, procurement, and installation; complete value analysis study; value tests; function-cost relationship, principles and procedures to optimize value in products. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, winter and spring quarters

**5.823 Advanced Production Analysis (4 q.h. credits)**

Study of advanced problem solving techniques in the areas of method and measurement, layout and facilities planning, material handling and manufacturing processes. Case studies and a course project in a local concern illustrate the concepts presented. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, days only, fall quarter

**5.824 Case Studies in Industrial Engineering**

Formulation of problems and analysis of situations on topics such as: work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written analysis of a variety of cases is included. *Prep. 5.823, Advanced Production Analysis.*

Offered yearly, days only, spring quarter

**5.830 Financial Management I**

Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. (Open to Engineering Management majors only.) *Prep. 5.801, Analysis of the Industrial Enterprise I, and 5.810, Industrial Accounting for Engineers, and 5.808, Basic Engineering Economy or equivalent.*

Offered yearly, all quarters

**5.831 Financial Management II**

Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prep. 5.830, Financial Management I.*

Offered yearly, all quarters

**5.840 Seminar on Management of Engineers**

Each student will prepare a term project on a subject of his choosing to be presented orally and in writing; discussions of major problem areas led by instructor and guest speakers. (Limited to 15 students selected from preregistration applications.) *Prep. 5.812 or 5.814 or 5.816 or 5.820.*

Offered yearly, spring quarter

**5.841 Engineering Project Administration**

Study of the problems of coordinating human, technical, and financial resources for initiating, conducting, and completing major technical projects; planning, organizing, staffing, directing, and controlling using modern concepts and techniques; scheduling, budgeting, communicating; coping with uncertainty and probability; analysis of typical cases. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall and spring quarters

**5.900 Basic Operations Research (4 q.h. credits)**

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Monte Carlo simulation. *Prep. 5.951, Engineering Statistics II or 10.8G1, Probability.*

Offered yearly, days only, fall quarter

**5.901 Basic Operations Research I**

Introduction to the theory and use of deterministic models to represent industrial operations; includes linear programming, dynamic programming, networks, and game theory. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, all quarters

**5.902 Basic Operations Research II**

Introduction to the theory and use of stochastic models to represent industrial operations; includes queuing, inventory, and Markovian models. *Prep. 5.901, Basic Operations Research I and 5.951, Engineering Statistics II or equivalent.*

Offered yearly, all quarters

**5.903 Inventory Control and Production Planning**

The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems, and a case study. *Prep. 5.951, Engineering Statistics II or equivalent.*

Offered yearly, spring quarter

**5.904 Queuing Theory and Its Applications**

A development of the theory of queues using the equations of detailed balance approach; study of models based on random arrivals including exponential and Erland service distributions, single and multiple services, series and parallel systems, and finite and infinite queues, applications to staffing, inventory control, maintenance, and scheduling. *Prep. 5.900 or 5.902, Basic Operations Research*

Offered yearly, winter quarter

**5.905 Analysis with Simulation**

Model building for digital simulation, testing and validation of models, simulation compiler languages, logic flow charting, applications drawn from economics,

scheduling, inventory problems, marketing, and others. *Prep. 5.913, Data Processing for Engineers and 5.951, Engineering Statistics II or equivalent.*

Offered yearly, winter quarter

### **5.906 Introduction to Principles of Systems**

Introduction to principles of system structure and dynamics with emphasis on managerial, economic, and social systems; development of concepts that allow one to understand stability and growth processes extending to multi-loop, non-linear systems. *Prep. Bachelor of Science degree in Engineering or Science.*

Offered yearly, fall quarter

### **5.907 Dynamics of Systems I**

Study of complex managerial, economic, and social systems emphasizing the interactions between decisions, actions, and information flows; analysis of the dynamic behavior of these systems by computer simulation with emphasis upon designing policies and information flow to generate more effective behavior; organizational control and growth viewed as dynamic feedback processes. Class project in a system identification, modelling and simulation, and analysis. *Prep. 5.906, Introduction to Principles of Systems.* Offered yearly, winter quarter

### **5.908 Dynamics of Systems II**

A project course in the application of principles of feedback systems on topics chosen by the students. Each student will carry out a complete social systems analysis, including definition of project purposes, system identification, system modelling and simulation, analysis of system behavior, and policy redesign. Limited enrollment. *Prep. 5.907 Dynamics of Systems I.*

Offered yearly, spring quarter

### **5.909 Systems Engineering and Analysis**

Methods of describing, analyzing, and manipulating complex systems both open and closed loop; meaning of system optimization; classical optimization techniques; emphasis on the description and design of a system rather than system manipulation and on "complete" system rather than submanipulation; examples drawn from transportation, information, manufacturing, etc. *Prep. Admission to the program.*

Offered yearly, days only, winter quarter

### **5.911 Linear Programming**

Covers in-depth techniques and theory contained in linear, quadratic, and non-linear programming which would include sensitivity analysis, the dual theorem, parametric programming, and problems involving uncertainty. *Prep. 5.900 or 5.902, Basic Operations Research or equivalent and a course in linear algebra.*

Offered yearly, spring quarter

### **5.912 Network Planning and Control**

Applications of the theory of flow through networks to scheduling, planning, line balancing, transportation, and materials handling; PERT and Critical Path Scheduling; case studies of successful and unsuccessful applications; computer and manual solutions utilized. *Prep. 5.913, Data Processing for Engineers or equivalent.*

Offered yearly, spring quarter

### **5.913 Data Processing for Engineers**

Open only to students who have not had a basic course or extensive experience in a compiler language. A study of digital computers and computer programming

techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN. A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

#### **5.914 Advanced Operations Research (4 q.h. credits)**

Further study of quantitative techniques available to assist management in scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems. *Prep. 5.900, Basic Operations Research.* Offered yearly, days only, spring quarter

#### **5.916 Engineering Analysis Utilizing Data Processing**

Engineering and quantitative management problems utilizing data processing equipment; problem formulation and adaptation to digital and/or analog equipment; case studies will be used to illustrate the applications. *Prep. 5.913, Data Processing for Engineers or equivalent.* Offered yearly, fall quarter

#### **5.917 Information Retrieval Techniques**

Fundamental aspects of information retrieval concepts, techniques, equipment and systems; subject analysis, classification, indexing, coding, storage search and retrieval; digital computer applications stressed, but manual and microfilm methods are covered; system evaluation; user requirements, operating personnel and implementation problems; future trends. *Prep. 5.913, Data Processing for Engineers or equivalent.* Offered yearly, winter quarter

#### **5.920 Computer Utility Systems**

The concepts and possible applications of computer networks providing on-line service to many users with widely different information processing service and capability needs; hardware and software considerations; cost and economic considerations; legal and security problems; reliability; evaluation for management decision or use; case histories. *Prep. 5.913, Data Processing for Engineers or equivalent.* Offered yearly, fall quarter

#### **5.921 Advanced Programming**

Study of selected topics in systems programming such as: programming languages and translators; data structures and data management; on-line, real-time and time-sharing systems; operating systems; and machine organization. Students should have a thorough knowledge of and experience with some programming language as well as a firm background in some machine at the assembly language level. *Prep. 3.893, Digital Computer Programming I.* Offered yearly, winter quarter

#### **5.922 Devices and Techniques of Information Systems**

Discussion, analysis, and evaluation of computing and data processing equipment excluding the CPU and main memory; emphasis on the characteristic use and control of secondary storage I/O and media conversion and data trans-



mission equipment; simulation studies, case studies, and student projects will be used as needed. *Prep. Basic knowledge of computers and programming.*  
Offered yearly, fall quarter

### **5.950 Engineering Statistics I**

A brief though rigorous introduction to probability as foundation for statistics; discrete and continuous distributions such as the binomial, Poisson, hypergeometric and normal; mean and variance; operations research; sampling distributions. *Prep. Bachelor of Science degree in Engineering or Science.*  
Offered yearly, all quarters

### **5.951 Engineering Statistics II**

An introduction to the techniques of statistical inference, treatment of statistical data, inferences concerning means, variances and proportions, regression analysis, correlation and other statistical concepts. *Prep. 5.950, Engineering Statistics I or 10.8G1, Probability or equivalent.* Offered yearly, all quarters

### **5.952 Design of Experiments**

An introduction to experimental design and analysis; modeling for fixed, random and mixed factor designs such as: single factor, randomized blocks, Latin square and factorial experiments, analysis of variance and covariance, orthogonal contrasts. *Prep. 5.951, Engineering Statistics II or 10.9H1, Mathematical Statistics or equivalent.* Offered yearly, fall quarter

### **5.953 Statistical Decision Theory**

Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. *Prep. 5.950, Engineering Statistics I or 10.8G1, Probability or equivalent.*

Offered yearly, fall quarter

### **5.954 Advanced Quality Control**

Economics of quality, specification of quality, organization for quality, statistical methods of quality control; quality policies and objectives; personnel methods for quality; design of testing and inspection procedures; budgeting of quality programs; sampling by variables, sampling for life testing, continuous sampling. *Prep. 5.951, Engineering Statistics II or equivalent.*

Offered yearly, winter quarter

### **5.955 Reliability and Maintainability Applications**

An introduction to reliability and maintainability engineering technology applied to system and circuit design; the "bath-tub" curve; stress de-rating of components; failure rate and repair rate prediction techniques and assessment; early failure, useful life, and wearout characteristics. *Prep. 5.951, Engineering Statistics II or equivalent.*

Offered yearly, fall quarter

### **5.956 Mathematical Theory of Reliability**

Probability mathematical techniques utilized in systems reliability analysis; prediction; allocation and demonstration testing; reliability probability functions, active and standby redundancy with or without repair, spares planning, and availability. *Prep. 5.955, Reliability and Maintainability Applications.*

Offered yearly, winter quarter

**5.957 Designing for Reliability**

Oriented to the design of electronic systems; development of complex system reliability mathematical models; Markovian chain stochastic processes, matrix algebra applied to redundancy problems; flow-diagram techniques using Laplacian transforms, and queuing theory for repairable systems; system-effectiveness methods particularly those developed by Hunter and Barlow. *Prep. 5.955, Reliability and Maintainability Applications.*

Offered yearly, spring quarter

**5.991 Thesis (Master's Degree) (6 q.h. credits)**

Analytical and/or experimental work conducted under the auspices of the department. *Prep. Consent of adviser.*

Offered yearly, all quarters

**5.992 Seminar in Industrial Engineering**

Discussion and presentations of thesis related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate.

Offered yearly, days only, fall quarter

**5.993 Special Problems in Industrial Engineering**

Individual work under faculty supervision. *Prep. Consent of adviser.*

Offered yearly, all quarters



# mechanical engineering

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained a Bachelor of Science degree in mechanical engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

## THE MASTER'S DEGREE

### Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Winter Quarters of the first year and in the Fall and Winter Quarters of the second year. The other quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

A thesis of ten quarter hours of credit is required unless waived by the department graduate committee.

Majors in mechanics, materials, heat, and ocean engineering are available. The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

MECHANICS MAJOR			
First Academic Quarter	Credits	Second Academic Quarter	Credits
2.801 Continuum Mechanics .	2	2.802 Continuum Mechanics .	2
2.860 Systems Engineering .	2	2.861 Systems Engineering .	2
10.8A1 Advanced		10.8A2 Advanced	
Mathematics . . . . .	2	Mathematics . . . . .	2
Electives . . . . .	4	Electives . . . . .	4
	10		10

Third Academic Quarter	Credits	Fourth Academic Quarter	Credits
2.990 Seminar .....	1	2.990 Seminar .....	1
2.991 Thesis .....	5	2.991 Thesis .....	5
Electives .....	4	Electives .....	4
	<hr/> 10		<hr/> 10

**MATERIALS MAJOR**

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.801 Continuum Mechanics or		2.802 Continuum Mechanics or	
2.960 Thermodynamics of Materials .....	2	2.961 Thermodynamics of Materials .....	2
2.970 Material Science & Engineering or		2.971 Material Science & Engineering or	
2.954 Advanced Physical Metallurgy I .....	2	2.956 Advanced Physical Metallurgy II .....	2
10.8A1 Advanced Mathematics .....	2	10.8A2 Advanced Mathematics .....	2
Electives .....	4	Electives .....	4
	<hr/> 10		<hr/> 10

Third Academic Quarter	Credits	Fourth Academic Quarter	Credits
2.954 Advanced Physical Metallurgy I or		2.956 Advanced Physical Metallurgy II or	
2.970 Material Science & Engineering .....	2	2.971 Material Science & Engineering .....	2
2.990 Seminar .....	1	2.990 Seminar .....	1
2.991 Thesis .....	5	2.991 Thesis .....	5
Elective .....	2	Elective .....	2
	<hr/> 10		<hr/> 10

**HEAT MAJOR**

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.801 Continuum Mechanics	2	2.802 Continuum Mechanics	2
2.901 Advanced Thermodynamics ....	2	2.902 Advanced Thermodynamics ....	2
2.910 Conduction Heat Transfer .....	2	2.911 Convection Heat Transfer .....	2
10.8A1 Advanced Mathematics .....	2	10.8A2 Advanced Mathematics .....	2
Elective .....	2	Elective .....	2
	<hr/> 10		<hr/> 10

Third Academic Quarter	Credits
2.990 Seminar .....	1
2.991 Thesis .....	5
Electives .....	4
	<hr/> 10

Fourth Academic Quarter	Credits
2.990 Seminar .....	1
2.991 Thesis .....	5
Electives .....	4
	<hr/> 10

### OCEAN ENGINEERING MAJOR

First Academic Quarter	Credits
2.801 Continuum Mechanics	2
2.870 Ocean Engineering I .....	2
2.873 Geophysical Engineering .....	2
10.8A1 Advanced Mathematics .....	2
Elective .....	2
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Second Academic Quarter	Credits
2.802 Continuum Mechanics	2
2.871 Ocean Engineering II .....	2
2.874 Ocean Measurements .....	2
10.8A2 Advanced Mathematics .....	2
Elective .....	2
	<hr/> 10

Third Academic Quarter	Credits
2.990 Seminar .....	1
2.991 Thesis .....	5
Electives and/or Marine Biology .....	4
	<hr/> 10

Fourth Academic Quarter	Credits
2.990 Seminar .....	1
2.991 Thesis .....	5
Electives .....	4
	<hr/> 10

### Continuous Full-Time Program

Students may take the 40 quarter hours of academic work on a continuous full-time basis and complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by their adviser.

### Electives

With the approval of the adviser, a maximum of ten quarter hours of credit may be elected from graduate courses in other departments.

### Part-Time Programs

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their abilities and the time available.

**REQUIRED COURSES**

<b>Mechanics Major</b>	<b>Credits</b>	<b>Materials Major</b>	<b>Credits</b>
10.8A1 or		10.8A1 or	
10.8A3 Advanced Mathematics	2	10.8A3 Advanced Mathematics	2
10.8A2 or		10.8A2 or	
10.8A4 Advanced Mathematics	2	10.8A4 Advanced Mathematics	2
2.801 Continuum Mechanics	2	2.801 Continuum Mechanics	
2.802 Continuum Mechanics	2	or	
2.860 Systems Engineering	2	2.960 Thermodynamics	
2.861 Systems Engineering	2	of Materials	2
	<hr/>	2.802 Continuum Mechanics	
	12	or	
		2.961 Thermodynamics	
		of Materials	2
		2.954 Advanced Physical	
		Metallurgy I	2
		2.956 Advanced Physical	
		Metallurgy II	2
		2.970 Material Science	
		and Engineering	2
		2.971 Material Science	
		and Engineering	2
			<hr/>
			16

<b>Heat Major</b>	<b>Credits</b>
10.8A1 or	
10.8A3 Advanced Mathematics	2
10.8A2 or	
10.8A4 Advanced Mathematics	2
2.801 Continuum Mechanics	2
2.802 Continuum Mechanics	2
2.901 Advanced	
Thermodynamics	2
2.902 Advanced	
Thermodynamics	2
2.910 Conduction	
Heat Transfer	2
2.911 Convection	
Heat Transfer	2
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**Electives**

Students must take sufficient mechanical engineering departmental electives so that the required courses in their major and the departmental electives total at least 30 of the 40 quarter hours required for the degree.

The remaining ten credits may be elected from any courses in engineering or science for which the student has the necessary preparation.

## **THE DOCTOR'S DEGREE**

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information, applicants should write to the Chairman of the Department of Mechanical Engineering.

### **Admission**

Applicants who are enrolled as candidates for the degree of Master of Science in Mechanical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Mechanical Engineering for admission to the doctoral program. Such application must be made by February 1st of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, transcripts of all undergraduate and graduate work, together with three letters of recommendation must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he will be invited to take the qualifying examination and if he should make formal application for admission to the doctoral program. The application for interview, transcripts, and letters of recommendation must be received by February 1st if the March qualifying examination is to be taken.

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work beyond the master's degree. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the master's degree.

### **Degree Candidacy**

After 40 quarter hours of graduate work have been taken with satisfactory grades and upon successful completion of the qualifying examination, a student is established as a degree candidate.

### **Qualifying Examination**

The qualifying examination in the Department of Mechanical Engineering is offered yearly in March and/or April and is both written and oral. The written portion of the qualifying examination is six hours in

length and covers, with equal emphasis, four different areas. A student must select one area from each of the three groups A, B, and C plus another area either listed below or unlisted, but considered equivalent and approved by the graduate committee.

**A.**

Concepts of Thermodynamics

Applied Thermodynamics

**B.**

Dynamics

Mechanics of Deformable Bodies

**C.**

Heat and Mass Transfer

Fluid Mechanics

Mechanical Behavior of Materials

Physical Metallurgy

The oral portion of the qualifying examination is conducted by a committee consisting of at least four members appointed by the graduate committee. A typical committee is composed of two members specializing in the student's major area plus one member from each of two other areas.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the master's degree. Because degree candidacy must be established before the graduate committee will act to approve course programs or thesis proposals, the qualifying examination should be taken at the earliest opportunity. If the examination is failed, it may be repeated with permission of the departmental graduate committee.

### **Course Requirements**

To receive the Ph.D. degree a candidate must complete a program of course work approved by the graduate committee. Courses completed prior to admittance to the doctoral program are subject to the approval of the graduate committee. Each program must contain at least twelve quarter hours of course work, preferably outside of the department, in an area other than that in which the candidate is majoring. Attainment of a B average for the courses in the "minor" portion of the program will signify satisfactory completion of that portion.

### **Thesis**

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes materials suitable for publication.

The departmental graduate committee may require the completion of certain course work before permitting thesis work to commence. A

thesis committee will be appointed by the chairman of the department upon the recommendation of the departmental graduate committee. The thesis committee will be kept informed of the progress of the thesis and will be responsible for initial approval of the thesis in its final form.

### Language Requirement

A reading knowledge of one foreign language is required. Proficiency in a language shall be determined in a manner prescribed by the departmental graduate committee. The language requirement must be satisfied no later than one year before the time at which the degree is to be conferred.

### Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the thesis has been completed and approved. This examination is based upon the subject matter of the thesis and a defense of it.

### Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination cannot be held until two weeks have elapsed after the thesis has been registered and accepted by the graduate school and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will include the subject matter of the doctoral thesis and significant developments in the field of the thesis work. Other fields may be included if recommended by the examining committee.

## DESCRIPTION OF COURSES

*The courses listed below are of an advanced undergraduate — first year graduate level. A maximum of eight (8) quarter hours of credit from this group of courses may be applied toward the master's degree.*

Course	Credits
2.212 Advanced Mechanics of Materials .....	4
2.214 Experimental Stress Analysis .....	4
2.232 Engineering Materials .....	4
2.233 Thermodynamics of Propulsion .....	4
2.235 Statistical Thermodynamics .....	4
2.236 Nuclear Engineering I .....	4
2.237 Nuclear Engineering II .....	4
2.258 Gas Dynamics .....	4
2.260 Heat and Mass Transfer .....	4
2.270 Analytical Dynamics .....	4

2.810	Advanced Mechanics of Materials I .....	2
2.811	Advanced Mechanics of Materials II .....	2
2.817	Strain Gage Techniques .....	2
2.818	Photoelasticity .....	2
2.847	Analytical Dynamics I .....	2
2.848	Analytical Dynamics II .....	2
2.924	Thermodynamics of Propulsion I .....	2
2.925	Thermodynamics of Propulsion II .....	2
2.950	Physical Metallurgy I .....	2
2.951	Physical Metallurgy II .....	2

*The following undergraduate courses which are given in the daytime, may be elected by graduate students for graduate credit subject to the credit hour restrictions listed above.*

#### **2.212 Advanced Mechanics of Materials (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.810 and 2.811 — Advanced Mechanics of Materials I and II. *Prep. Admission to the Graduate School of Engineering.* Offered 1971–72, fall and winter quarters

#### **2.214 Experimental Stress Analysis (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.817, Strain Gauge Techniques and 2.818, Photoelasticity. *Prep. Admission to the Graduate School of Engineering.* Offered 1971–72, fall and winter quarters

#### **2.232 Engineering Materials (4 q.h. credits)**

This course, offered to day students, covers thermodynamics of materials; phase equilibria ternary systems; reactions with environment, i.e. kinetics, oxidation, corrosion, etc.; materials design criteria and materials engineering case studies. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971–72, fall and winter quarters

#### **2.233 Thermodynamics of Propulsion (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.924 and 2.925, Thermodynamics of Propulsion. *Prep. Admission to the Graduate School of Engineering.* Offered 1971–72, spring quarter

#### **2.235 Statistical Thermodynamics (4 q.h. credits)**

Statistical thermodynamics approaches the study of the thermodynamics equilibrium by regarding a system as a collection of particles to which the principles of either classical or quantum mechanics are presumed to apply; statistical hypotheses of Boltzmann, Bose-Einstein, and Fermi-Dirac with emphasis on the properties of assemblies of independent particles; applications to the study of gaseous systems; the Einstein and Debye theories of the specific heats of solids; electron gas in a metal. *Prep. Admission to the Graduate School of Engineering.* Offered 1971–72, spring quarter

#### **2.236 Nuclear Engineering I (4 q.h. credits)**

Study of Nuclear Physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fusion and fission; health physics, nuclear instrumentation, and the production and uses of radioactive isotopes; comparison of thermal, fast, and breeder reactor types; dis-



cussion of neutron interactions and slowing down; four factor formula and the diffusion equation developed and applied to one-group theory for bare and reflected thermal reactors; energy production and distribution within the core; flux shaping. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, fall and winter quarters

### **2.237 Nuclear Engineering II (4 q.h. credits)**

Development of two-group theory for thermal reactors; the physics and safety of fast reactors; effect of reactivity change, either intentional or accidental, changes due to temperature; fission product buildup, xenon buildup after shutdown, and fuel depletion; reactor design considerations including the interrelationship of reactor physics, reactor engineering (physical design heat transfer, etc.), reactor materials and economics; control and distribution of power; fuel cycle management. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, spring quarter

### **2.258 Gas Dynamics (4 q.h. credits)**

Derivation of the conservation laws of fluid flow; wave motion and Mach number; adiabatic flow; calculation of propulsion forces; adiabatic flow with friction; normal shock analysis; analysis of compressible flow with heating or cooling; moving and oblique shock waves. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, spring quarter

### **2.260 Heat and Mass Transfer (4 q.h. credits)**

Review of heat, mass, and momentum transfer analogies; rate equations; conduction problems in steady-state and transient-state for both heat and mass transfer with various constant and fluctuating boundary conditions in rectangular, cylindrical, and spherical coordinates solved by formal mathematics, difference (relaxation) techniques and methods of analogy; thermal stresses induced by non-uniform temperature distributions; heat transfer at high velocity and in rarefied gases; boiling heat transfer at temperature extremes, with forced and natural convection; phase change in bulk stagnant systems. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, spring quarter

### **2.270 Analytical Dynamics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.847 and 2.848 — Analytical Dynamics I and II. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, spring and summer quarters

*The following are graduate courses which carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.*

### **2.801 Continuum Mechanics**

Algebra and calculus of Cartesian tensors, relation to vector analysis, curvilinear co-ordinates, stress in a continuum. *Prep. 10.8A1, Advanced Mathematics (may be taken concurrently) or equivalent.*

Offered in 1971-72, fall and winter quarters

**2.802 Continuum Mechanics**

Strain and strain rate in a continuum, governing equations for an elastic solid and a Newtonian fluid. Some exact solutions. *Prep. 2.801, Continuum Mechanics and 10.8A2, Advanced Mathematics (math may be taken concurrently).*

Offered 1971-72, all quarters

**2.803 Continuum Mechanics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.801 and 2.802, Continuum Mechanics. *Prep. 10.9N1 or 10.9N2, Advanced Mathematics or equivalent.*

Not offered 1971-72

**2.805 Theory of Elasticity**

Stress and deformation analysis of elastic solids. Two-dimensional problems; stress concentration; thermal stress. Theory of torsion, prismatic and axial symmetric bars. Introduction to the theory of plates, bending of thin plates. *Prep. 2.802, Continuum Mechanics.*

Offered 1971-72, fall quarter

**2.806 Theory of Elasticity**

Method of finite differences. Numerical solutions; torsion problem; plate bending. Variational method and energy principles; minimum potential and complementary energy theorems. Introduction to dynamics of elastic solids; waves, vibrations. *Prep. 2.805, Theory of Elasticity.*

Offered 1971-72, winter quarter

**2.807 Theory of Elasticity (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.805 and 2.806, Theory of Elasticity. *Prep. 2.803, Continuum Mechanics.*

Not offered 1971-72

**2.809 Plasticity and Creep**

Types of deformation, elasticity, plasticity, creep, mechanical equation of state, plastic flow under multi-axial stress, and elastic creep. Relationship of comparatively simple laboratory material tests to more complex service conditions will be emphasized. *Prep. 2.950 and 2.951, Physical Metallurgy I and II.*

Offered 1972-73, spring quarter

**2.810 Advanced Mechanics of Materials I**

Review of fundamental stress concepts; point stress and strain; differential equations of stress; elastic properties; theories of failure; transverse bending; shear stress distribution; shear center; bending stresses due to non-symmetrical bending. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, fall quarter

**2.811 Advanced Mechanics of Materials II**

Thick and thin cylinders under elastic and plastic deformation; analysis of statistically indeterminate beams and frames by slope, deflection, and moment distribution techniques; stresses in curved beams, beams on elastic foundations. *Prep. 2.810, Advanced Mechanics of Materials I.*

Offered 1971-72, winter quarter

**2.813 Advanced Mechanics of Materials III**

Bending of flat plates; stability analysis of structural members; grid systems and other special topics to be selected by needs of the class. *Prep. 2.811, Advanced Mechanics of Materials II.*

Offered 1971-72, spring quarter

**2.815 Plates and Shells**

Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. *Prep. 2.806, Theory of Elasticity.*

Offered 1971-72, spring quarter

**2.817 Strain Gauge Techniques**

Theory and application of mechanical and electrical strain gauges. Installation, instrumentation, and circuitry of gauge set-ups for transducer use and experimental stress analysis. Use of brittle coatings in experimental stress analysis. *Prep. Admission to Graduate School of Engineering.*

Offered 1971-72, spring quarter

**2.818 Photoelasticity**

Theory and practice of photoelastic methods as applied to classical experimental stress analysis of models and as modified for use in photoelastic coatings. *Prep. Admission to Graduate School of Engineering.*

Offered 1972-73, spring quarter

**2.820 Fluid Dynamics**

Vorticity and circulation. Kelvin and Helmholtz theorems. Potentials and stream functions; Biot-Savart Law. Bernoulli relations. Complex variable theory applied to the solution of potential flows. Theorems of Blasius and Kutta-Joukowski. *Prep. 2.802, Continuum Mechanics.*

Offered 1971-72, fall quarter

**2.821 Fluid Dynamics**

Surface waves and conditions at an interface. Some exact solutions of the Navier-Stokes equations. Stokes flow. Fundamentals of boundary layer theory; separation. Introduction to turbulence and stability. *Prep. 2.820, Fluid Dynamics.*

Offered 1971-72, winter quarter

**2.822 Fluid Dynamics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.820 and 2.821—Fluid Dynamics. *Prep. 2.803, Continuum Mechanics.*

Not offered 1971-72

**2.823 Advanced Gas Dynamics**

Sound speed in a gas. Shock waves. Characteristics. One and two dimensional steady flows. One-dimensional unsteady flow. Small perturbation theory. Similarity rules, hodograph methods. *Prep. 2.821, Fluid Dynamics.*

Not offered 1971-72

**2.824 Advanced Gas Dynamics**

Continuation of 2.823, Advanced Gas Dynamics. *Prep. 2.823, Advanced Gas Dynamics.*

Not offered 1971-72

**2.825 Advanced Gas Dynamics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.823 and 2.824—Advanced Gas Dynamics. *Prep. 2.822, Fluid Dynamics.*

Not offered 1971-72

**2.830 Orbital and Ballistic Mechanics**

Orbit mechanics, dealing with the two-body problem of unpowered coasting flights, orbital transfers, staging theory. *Prep. Admission to the Graduate School of Engineering.*

Offered 1972-73, fall quarter

**2.831 Orbital and Ballistic Mechanics**

Analysis of orbits aimed at specific missions such as Lunar, Venus, and Mars — one and two-way trips. *Prep. 2.830, Orbital and Ballistic Mechanics.*

Offered 1971-72, fall quarter

**2.832 Orbital and Ballistic Mechanics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.830 and 2.831, Orbital and Ballistic Mechanics. *Prep. Admission to the Graduate School of Engineering.*

Not offered 1971-72

**2.834 Dynamics of Re-entry Vehicles**

Rigid vehicle kinematics, basic vehicle dynamics, definition and transformation of various axes systems associated with the vehicle motion, re-entry aerodynamic forces and heating, approximate solutions of entry dynamics, applications of fundamental theory to industrial problems on re-entry vehicle dynamics. *Prep. 2.830, Orbital and Ballistic Mechanics or equivalent.*

Not offered 1971-72

**2.835 Advanced Dynamics of Re-entry Vehicles**

Continuation of 2.834, Dynamics of Re-entry Vehicles. *Prep. 2.834, Dynamics of Re-entry Vehicles.*

Not offered 1971-72

**2.836 Dynamics and Advanced Dynamics of Re-entry Vehicles (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.834, Dynamics of Re-entry Vehicles and 2.835, Advanced Dynamics of Re-entry Vehicles. *Prep. 2.832, Orbital and Ballistic Mechanics.*

Not offered 1971-72

**2.837 Special Topics: Orbital and Ballistic Mechanics**

Low thrust vehicle analysis with emphasis on optimization, transfer between orbits, boost analysis. *Prep. 2.831, Orbital and Ballistic Mechanics.*

Not offered 1971-72

**2.842 Vibration Theory and Applications**

Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillation, frequency equation, energy in a vibrating system, energy methods of solution, Rayleigh's method. *Prep. 2.861, Systems Engineering.*

Offered 1971-72, fall quarter

**2.843 Vibration Theory and Applications**

Continuation of 2.842 including systems with distributed mass and stiffness, shock and impact, balancing of rotating machinery, vibrations of beams and related structures. *Prep. 2.842, Vibration Theory and Applications.*

Offered 1971-72, winter quarter

**2.844 Vibration Theory and Applications (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.842 and 2.843, Vibration Theory and Applications. *Prep. 2.862, Systems Engineering.*

Not offered 1971-72

**2.845 Shock, Vibration, and Noise Control**

Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state vibration, random vibration, and acoustic noise. *Prep. 2.843, Vibration Theory and Applications.*

Offered 1971-72, spring quarter

**2.846 Non-Linear Vibrations**

Studies of various non-linear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed. *Prep. 2.843, Vibration Theory and Applications.* Not offered 1971-72

**2.847 Analytical Dynamics I**

Application of fundamental laws of motion. Dynamics of a particle, motion of a projectile, linear and angular momentum, impact, kinetic energy, and work. Variable and constant mass systems. Vector notation is used. *Prep. Admission to the Graduate School of Engineering.* Offered 1971-72, winter quarter

**2.848 Analytical Dynamics II**

Continuation of 2.847, Analytical Dynamics I, includes Hamilton's Principle, Euler's Equation, rotation of a rigid body, gyroscopes, and dynamic problems using analog computer. *Prep. 2.847, Analytical Dynamics I.*

Offered 1971-72, spring quarter

**2.850 Automatic Control Engineering**

Basic methods for analyzing and designing linear feedback control systems. Formulation of transfer functions and block diagrams representing physical components and systems. Study of control action. Analysis and design by use of root-locus and frequency-domain techniques. *Prep. 2.861, Systems Engineering.* Offered 1971-72, fall quarter

**2.851 Automatic Control Engineering**

General theory of automatic control. Further consideration of linear systems including compensating methods and multiple-inputs. Techniques for the treatment of non-linear systems. Study of the details of components such as hydraulic and pneumatic servo valves, pneumatic power amplifiers, etc. *Prep. 2.850, Automatic Control Engineering.* Offered 1971-72, winter quarter

**2.852 Automatic Control Engineering (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.850 and 2.851, Automatic Control Engineering. *Prep. 2.862, Systems Engineering.*

Not offered 1971-72

**2.853 Fundamentals of Instrumentation**

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prep. Bachelor of Science Degree.*

Not offered 1971-72

**2.854 Industrial Process Control**

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH. *Prep. 2.853, Fundamentals of Instrumentation.* Offered 1971-72, fall quarter

**2.860 Systems Engineering**

The modeling and analysis of physical systems. Vibration of mechanical systems with one degree of freedom including the free-body and energy methods of

formulating the equations of motion. Free vibration of undamped multi-degree-of-freedom systems; influence coefficients; matrix notation and iteration. Mechanical network or mobility-diagram representations; block diagramming. Laplace transform techniques. *Prep. Admission to the Graduate School of Engineering.*  
Offered 1971-72, fall and winter quarters

### **2.861 Systems Engineering**

Continuation of 2.860. Transient analysis. Analog computation. Frequency response techniques. *Prep. 2.860, Systems Engineering.*  
Offered 1971-72, all quarters

### **2.862 Systems Engineering (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.860 and 2.861, Systems Engineering. *Prep. Admission to the Graduate School of Engineering.*  
Not offered 1971-72

### **2.870 Ocean Engineering I**

Extent of the ocean in general with its physical and chemical properties; emphasis on the three dimensional temperature distribution with time as a variable; the salinity and its variation in oceanic space and time; the density of the ocean and its stability; temperature-salinity relationships and their connection with mixing processes with large water masses; evaporation and water budget of the earth, and ice in the ocean. *Prep. Admission to the Graduate School of Engineering.*  
Offered 1971-72, fall quarter

### **2.871 Ocean Engineering II**

Geophysical structure of the sea; forces and their relation to the structure of the ocean; ocean statics, oceanic kinematics; theory of ocean currents in a homogeneous and non-homogeneous ocean; strait currents; effect of wind; the mass field and density current; fundamental principles of oceanic circulation in the troposphere and stratosphere. *Prep. 2.870, Ocean Engineering I.*  
Offered 1971-72, winter quarter

### **2.873 Geophysical Engineering**

Theory of basic geophysical methods, seismology, magnetics, gravity, and electromagnetic potential relating to ocean research and exploration with emphasis on theory, data processing, computer applications; interpretation of data and their applications; instrument systems; survey procedures; profiling; surface ship systems applications and deep submersible applications. *Prep. Admission to the Graduate School of Engineering.* Offered 1971-72, fall quarter

### **2.874 Ocean Measurements**

Instrument design; theory application for physical and chemical properties; bathymetry; temperature, velocity and geophysical aspects of seismic, gravity, magnetic, and electromagnetic methods. *Prep. 2.873, Geophysical Engineering.*  
Offered 1971-72, winter quarter

### **2.901 Advanced Thermodynamics**

A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including: equilibrium, heat, and work; the first and second law of thermodynamics; energy; heat engines, simple systems, and open systems. *Prep. Admission to the Graduate School of Engineering.*  
Offered 1971-72, fall quarter



**2.902 Advanced Thermodynamics**

Continuation of 2.901 including: examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures. *Prep. 2.901, Advanced Thermodynamics.*  
Offered 1971-72, winter quarter

**2.903 Advanced Thermodynamics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.901 and 2.902—Advanced Thermodynamics. *Prep. Admission to the Graduate School of Engineering.*  
Not offered 1971-72

**2.904 Special Topics in Advanced Thermodynamics**

Selected subjects of current interest in general thermodynamics including: chemical reactions; the law of stable equilibrium, normal and special systems, and the third law. Detailed analysis of the statistics of ensembles is also covered to emphasize the relationship between thermodynamics and statistical mechanics. *Prep. 2.902, Advanced Thermodynamics.*

Offered 1971-72, spring quarter

**2.905 Cryogenic Engineering**

Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications. Problems will be assigned typical of those which are encountered in the field and laboratory. *Prep. Admission to the Graduate School of Engineering.*  
Offered 1971-72, fall quarter

**2.906 Cryogenic Engineering**

Continuation of 2.905, Cryogenic Engineering. *Prep. 2.905, Cryogenic Engineering.*  
Offered 1971-72, winter quarter

**2.907 Cryogenic Engineering**

Application of Cryogenic Engineering Principles to the design of integrated systems. *Prep. 2.906, Cryogenic Engineering.* Offered 1971-72, spring quarter

**2.910 Conduction Heat Transfer**

Basic laws of heat transfer; analytical solutions of single and multidimensional systems in steady and transient states with and without heat sources in cartesian, cylindrical, and spherical coordinates; chart solutions; Newtonian method, steady state and transient numerical analysis; generalized fin equation. *Prep. Elements of Heat Transfer.* Offered 1971-72, fall and winter quarters

**2.911 Convection Heat Transfer**

Fundamentals of convection; Reynolds, Prandtl, and Nusselt numbers; elements of boundary layer theory; free and forced convection in ducts and over flat plates solved by dimensional, exact mathematical and approximate integral analyses for both laminar and turbulent flows; Reynolds analogy and Prandtl's modification; boiling and condensation; heat transfer in high speed flow; heat exchangers. *Prep. 2.910, Conduction Heat Transfer.*

Offered 1971-72, all quarters

**2.912 Heat Transfer (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.910 and 2.911, Heat Transfer. *Prep. Admission to the Graduate School of Engineering.*

Not offered 1971-72

**2.913 Radiation Heat Transfer**

Basic laws of thermal radiation; Planck black body radiation; Kirchhoff's laws; Stefan-Boltzmann law; radiation properties of surfaces; radiative transfer between gray and non-gray diffuse and specular surfaces separated by transparent media; radiation properties of gases; radiative transfer through absorbing, emitting, and scattering media; radiative transfer in the presence of conduction and convective heat transfer. *Prep. 2.910, Conduction Heat Transfer.*

Offered 1971-72, spring quarter

**2.920 Direct Energy Conversion**

The fundamental processes of direct energy conversion and their application to the design and operation of magnetohydrodynamic power generators, thermionic converters, fuel cells, and thermoelectric converters. *Prep. Admission to the Graduate School of Engineering.*

Offered 1972-73, fall quarter

**2.921 Direct Energy Conversion**

Continuation of 2.920. *Prep. 2.920, Direct Energy Conversion.*

Offered 1972-73, winter quarter

**2.922 Direct Energy Conversion (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.920 and 2.921, Direct Energy Conversion. *Prep. Admission to the Graduate School of Engineering.*

Not offered 1971-72

**2.923 Special Topics in Direct Energy Conversion**

Irreversible thermodynamics. Unified theory of energy conversion. *Prep. 2.921 or 2.922, Direct Energy Conversion.*

Offered 1972-73, spring quarter

**2.924 Thermodynamics of Propulsion I**

Application of the physical principles of thermodynamics, fluid mechanics, and plasmas to the prediction of the behavior of propulsion devices. The fundamentals of mechanics and thermodynamics of fluid flow, boundary layer mechanics, and heat transfer are reviewed. Air-breathing engines and rocket engines are discussed in detail with emphasis on realistic applications to demonstrate how physical laws both describe and limit the performance of particular devices. An introduction to plasmas. The fundamentals of electrical rocket propulsion. *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, fall quarter

**2.925 Thermodynamics of Propulsion II**

Continuation of 2.924, Thermodynamics of Propulsion I. *Prep. 2.924, Thermodynamics of Propulsion I.*

Offered 1971-72, winter quarter

**2.927 Fundamentals of Combustion**

An introduction to the science of combustion. The fundamentals of gas reaction, combustion in pre-mixed gases, combustion without pre-mixing, and heat and mass transfer with chemical reactions are included. *Prep. 2.925 Thermodynamics of Propulsion II.*

Offered 1971-72, spring quarter



**2.930 Pumps**

Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines. *Prep. Hydraulics.*

Offered 1971-72, winter quarter

**2.931 Fans and Blowers**

Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head-on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers. *Prep. Thermodynamics.*

Offered 1971-72, spring quarter

**2.935 Power Plant Economics and Design**

An integrated study into the economic and design considerations for both isolated and control station systems. *Prep. Thermodynamics.*

Not offered 1971-72

**2.936 Power Plant Economics and Design**

Continuation of 2.935, Power Plant Economics and Design. *Prep. 2.935, Power Plant Economics and Design.*

Not offered 1971-72

**2.937 Power Plant Economics and Design (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.935, and 2.936, Power Plant Economics and Design. *Prep. Thermodynamics.*

Not offered 1971-72

**2.945 Special Topics Computer Methods for Mechanical Systems**

(4 q.h. credits)

Finite difference approximations. Analysis of errors in finite difference approximations. Generation of higher order finite difference equations. Applications to plates, strings, and membranes. Two-point boundary value problems. Analysis of propagation problems including Euler and Runge Kutta methods and method of characteristics. Stability of difference schemes. *Prep. Admission to the Graduate School of Engineering.*

Not offered 1971-72

**2.950 Physical Metallurgy I**

Atomic structure, bonding, crystallography and crystal structure; phase equilibrium and non-equilibrium of 1, 2, and 3 component systems. (Not required for materials majors who have completed a recent course in material science.) *Prep. Admission to the Graduate School of Engineering.*

Offered 1971-72, fall quarter

**2.951 Physical Metallurgy II**

Defects in crystals; micro plasticity of crystals, plastic deformation of crystalline solids; recrystallization; recovery grain growth. *Prep. 2.950, Physical Metallurgy I.*

Offered 1971-72, winter quarter

**2.952 Physical Metallurgy III**

Theory of solid-solutions and intermetallic compounds; theory of phase transformations in solids; nucleation and growth; pearlitic and martensitic transformations. *Prep. A recent introductory material science course.*

Offered 1971-72, spring quarter

**2.953 Advanced Physical Metallurgy III**

Point defects in crystals; theory of diffusion in solids, including diffusion equations, mechanisms, effect of concentration gradients, diffusion in non-metallic solids; oxidation. *Prep. A recent introductory material science course.*

Offered 1971-72, spring quarter

**2.954 Advanced Physical Metallurgy I**

Dislocation theory; including such topics as dislocation stress fields, self energy, velocity, interactions mechanisms, image forces, and theories of yielding. *Prep. A recent introductory material science course.*

Offered 1971-72, fall quarter

**2.955 Advanced Physical Metallurgy A (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.952, Physical Metallurgy III and 2.953, Advanced Physical Metallurgy III. *Prep. 2.232 or 2.951, Physical Metallurgy II.*

Not offered 1971-72

**2.956 Advanced Physical Metallurgy II**

Mechanical behavior of metals. Application of dislocation theory to microplasticity, strain hardening, strengthening mechanisms and creep. *Prep. 2.954, Advanced Physical Metallurgy I.*

Offered 1971-72, winter quarter

**2.957 Advanced Physical Metallurgy B (4 q.h. credits)**

This course offered to day students, embodies the material in 2.954 and 2.956, Advanced Metallurgy I and II. *Prep. 2.232 or 2.951, Physical Metallurgy II.*

Not offered 1971-72

**2.960 Thermodynamics of Materials I**

Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prep. Engineering Materials.*

Offered 1971-72, fall quarter

**2.961 Thermodynamics of Materials II**

Continuation of 2.960 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. *Prep. 2.960, Thermodynamics of Materials I.*

Offered 1971-72, winter quarter

**2.962 Thermodynamics of Materials (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.960 and 2.961 — Thermodynamics of Materials I and II. *Prep. Engineering Materials.*

Not offered 1971-72

**2.963 Thermodynamics of Materials III**

The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamics systems analysis. *Prep. 2.960 or 2.961 or 2.962, Thermodynamics of Materials.*

Offered 1971-72, spring quarter

**2.965 Physical Ceramics**

Introduction to ceramic fabrication processes. Characteristic of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prep. A recent introductory material science course, Physical Chemistry or Solid State Physics.*

Not offered 1971-72

**2.966 Physical Ceramics**

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. *Prep. 2.965, Physical Ceramics.*

Not offered 1971-72

**2.967 Physical Ceramics (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.965 and 2.966, Physical Ceramics. *Prep. 2.232 or Physical Chemistry or Solid State Engineering.*

Not offered 1971-72

**2.970 Material Science and Engineering**

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prep. A recent introductory material science course.*

Offered 1971-72, fall quarter

**2.971 Material Science and Engineering**

Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prep. 2.970, Material Science and Engineering.*

Offered 1971-72, winter quarter

**2.972 Material Science and Engineering (4 q.h. credits)**

This course, offered to day students, embodies the material in 2.970 and 2.971, Material Science and Engineering. *Prep. 2.232 or equivalent.*

Not offered 1971-72

**2.974 Material Science and Engineering — Special Topics**

Continuation of 2.971. Optical properties and various special topics that vary from year to year. Examples are: metastable phases, thin films, and strengthening mechanisms. *Prep. 2.971, Material Science and Engineering.*

Offered 1971-72, spring quarter

**2.975 Principles of X-Ray Diffraction**

General properties of x-rays. X-Ray production and detection. Emission and absorption. Introduction to diffraction and factors influencing the intensities. Analysis of diffraction patterns. *Prep. A recent introductory material science course.*

Offered 1971-72, fall quarter

**2.976 Applications of X-Ray Diffraction**

Experimental methods. Applications, including: single crystal orientation, crystallite size measurement, preferred orientation, residual stresses, precision lattice-parameter measurement, phase-diagram determination, chemical analysis. *Prep. 2.975, Principles of X-Ray Diffraction.* Offered 1971-72, winter quarter

**2.985 Powder Metallurgy**

Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. *Prep. A recent introductory material science course.* Offered 1971-72, spring quarter

**2.990 Mechanical Engineering Seminar**

Discussions by industrial leaders, faculty, and graduate students on various subjects. Open to day students only. *Prep. Admission to Master of Science program.* Offered yearly, fall and winter quarters

**2.991 Thesis (Master's Degree)**

Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to Master of Science program.* Offered yearly, all quarters

**2.992 Special Problems in Mechanical Engineering**

Theoretical or experimental work under individual faculty supervision. *Prep. Consent of department chairman.* Offered yearly, all quarters

**2.993 Special Topics in Mechanical Engineering**

Topics of interest to the staff member conducting this class are presented for advanced study. *Prep. Permission of department staff.*

Offered yearly, all quarters

**2.994 Doctoral Reading**

Material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prep. Passing of Ph.D. Qualifying Exam.*

Offered yearly, all quarters

**2.995 Thesis (Ph.D. Degree)**

Theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prep. Admission to the Doctoral Program in Mechanical Engineering.*

Offered yearly, all quarters

# mathematics

## DESCRIPTION OF COURSES

*The following courses are primarily for students in the engineering programs. All courses carry two quarter hours of credit unless otherwise specified. Courses carrying four quarter hours of credits are offered in the day only.*

### **10.8A1 Advanced Mathematics I (2 q.h.)**

Series solution of differential equations; Legendre and Bessel functions; Laplace transforms; scalar and vector fields; gradient, divergence, and curl. *Prep. Differential Equations.*

### **10.8A2 Advanced Mathematics II (2 q.h.)**

Fourier series and integrals, orthogonal functions, boundary-value problems involving partial differential equations: wave equation, heat flow, Laplace equation. *Prep. 10.8A1 or equivalent.*

### **10.9N1 Advanced Mathematics A (4 q.h.)**

Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra. *Prep. Differential Equations.*

### **10.8A3 Advanced Mathematics III (2 q.h.)**

Matrix algebra, determinants, inversion of matrices, rank and equivalence, linear equations and linear dependence, vector spaces, and linear transformations. *Prep. 10.8A2.*

### **10.8A4 Advanced Mathematics IV (2 q.h.)**

Further topics in matrices and vector spaces. *Prep. 10.8A3.*

### **10.9N2 Advanced Mathematics B (4 q.h.)**

This course embodies the material in 10.8A3 and 10.8A4. *Prep. 10.9N1.*

### **10.8G1 Probability I (2 q.h.)**

Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem. *Prep. Differential and Integral Calculus.*

### **10.8G2 Probability II (2 q.h.)**

Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains. *Prep. 10.8G1.*

**10.8G4 Mathematical Statistics I (2 q.h.)**

Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression. *Prep. 10.8G1 or equivalent.*

**10.8G5 Mathematical Statistics II (2 q.h.)**

Analysis of variance; further topics in statistical inference. *Prep. 10.8G4.*

**10.9H1 Mathematical Statistics (4 q.h.)**

This course embodies the material in 10.8G4 and 10.8G5. *Prep. 10.8G1 or equivalent.*

For physics and other mathematics courses consult the latest bulletin of the Graduate School of Arts and Sciences.

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